

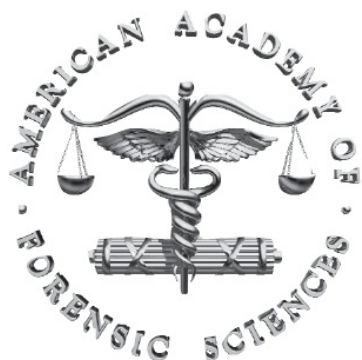
FORENSIC SCIENCES: GENERAL

Proceedings 2002-2011

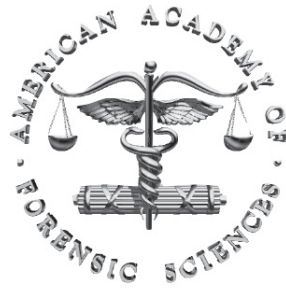


AMERICAN ACADEMY
of FORENSIC SCIENCES

Forensic Sciences: General



Forensic Sciences: General



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Preface

The American Academy of Forensic Sciences (AAFS) is a multi-disciplinary professional organization created and maintained to provide leadership in the application of science to the legal system. A premier forensic science organization, its specific objectives are to promote professionalism, integrity, competency and education, and to foster scientific research, improvements in the practice of forensic science, and collaboration within the many fields of forensic science.

For sixty-three years, since its founding in 1948, the AAFS has served a distinguished and diverse membership. It comprises eleven different sections representing the broad range of expertise and interest of its members, now numbering over 6200. Included among them are physicians, attorneys, dentists, toxicologists, physical anthropologists, document examiners, psychiatrists, physicists, engineers, criminalists, educators, and digital evidence specialists. Representing all fifty US states, all ten Canadian provinces and 61 other countries from all corners of the world, AAFS members actively practice forensic science. In many cases, AAFS members also teach and conduct research in the field, producing hundreds of refereed publications and books.

The editors express gratitude to the past and present AAFS leadership, especially to the AAFS staff headed by Executive Director Anne Warren, to the AAFS Presidents since 1949, and to our section's directors and chair persons.

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This further acknowledges the excellent work of all our General section's authors and colleagues worldwide who are willing to share their work for education.

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Prepared by:
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¹ The Executive Committee of The American Academy of Forensic Sciences has directed Laura Liptai, Ph.D. of the Engineering Sciences Section to prepare this volume for publication.

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D1 Development of a Science Based Fingerprint Curriculum

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After attending this presentation, attendees will be introduced to a project that is developing a science-based curriculum addressing the recommendations set forth in the National Academy of Science (NAS) Report.

This presentation will impact the forensic science community by demonstrating the process of a first-principles approach to forensic fingerprint curriculum.

In order to fully understand and appreciate the study of friction ridge skin and its resultant impressions, it is necessary to have a basic understanding of the fundamental principles upon which this discipline rests. Forensic science can be traced back to the comparative methods proposed by Aristotle. The later writings of Georges Cuvier and Thomas Huxley further supported the utility of comparative methods in science. Ernst Mayr stated in his publication *The Growth of Biological Thought* that “the branches of science that depend on the comparative method are not inferior” to experimental methods (p. 32); however, he also stressed that scientific progress is made “with the introduction of new concepts or improved old ones” (p. 23). Friction skin formation has its foundations in anatomy, physiology, anthropology, and embryology; and through research has evolved to a source of personal identification using the comparative method.

The NAS Report suggested the need for an understanding of the “principles, practices, and contexts of science” (8-1) in conjunction with hands-on training that closely mimics the experiences of forensic practice. It is through “formal education, training, and the proper conduct of research” that the “scientific knowledge, principles, and practices of forensic science disciplines must be based” (8-1). Academic curricula guided by the requirements set forth by organizations such as SWGFAST and ASCLD-LAB are needed.

The goal of the fingerprint curriculum is to be comprehensive, covering core and discipline specific elements, and to include with each module teaching information, learning materials, practical exercises, and assessments. As the curriculum progresses, it will reference the first principles outlined in beginning sections and published materials to insure mastery and include frequent hands-on and interactive lessons. Module topics and lesson objectives will be available to the attendee for review. Once complete, the comprehensive curriculum will be available publicly at no cost for use by practitioners, educators, students, and trainees. The modules are designed to be used independently, in whole or in part, based on the instructors’ goals.

The goal is to provide a course to be included in a forensic science program whose goal it is to produce forensic scientists well versed in science, the law, quality assurance procedures, research, and discipline specific information and techniques. Research has been conducted to gather information regarding curricula in other scientific disciplines, current fingerprint curricula, history of the comparative method, and fingerprint specific history, practice, and ongoing research. The following module topics will be included in the curriculum:

- Module 1: Science and First Principles
- Module 2: What is a Fingerprint: Anatomical, Physiological, Anthropological, and Embryological Considerations
- Module 3: History of Identification
- Module 4: Classification and Taxonomy
- Module 5: Forensic Science and Fingerprints
- Module 6: Fingerprint Detection, Visualization, and Preservation
- Module 7: Comparisons and Conclusions
- Module 8: Fingerprints and the Law
- Module 9: Research and Quality Assurance

Traditionally, fingerprint training has been based on historical or experiential curricula and materials (top-down) rather than from a fundamental starting point and building to actual practice (bottom-up). This new approach will first create an understanding of the science supporting the discipline followed by an incorporation of the practice.

Education, Fingerprint, Curriculum

D2 Incorporating Forensic Nursing Education Into Undergraduate Nursing Programs: A Simulation Approach

Stacy A. Drake, MSN, MPH, 6510 Acorn Court, Pearland, TX 77584*

After attending this presentation, attendees will have a blueprint for integrating forensic knowledge in nursing education or other health care curriculums. The presentation embraces the premise that forensic nursing should be included in the Bachelor of Science in nursing curriculum because of the potential impact on the forensic community and the public health care system.

This presentation will impact the forensic science community and public health care system by serving as an example of how forensic nursing content can be included within undergraduate nursing curriculums. The examples provided include knowledge of forensic nursing as well as permitting the student to synthesize this information via simulation of forensic cases.

Because of the national nursing shortage, nursing education nationwide is pared to the essentials required by the state boards of nursing and accreditation agencies; programs are accelerated leaving no room for alternate tracks or electives. However, given that nursing students in their clinical rotations will inevitably be exposed to wound care, family dynamics, pediatric and elder patients suffering from abuse, and like situations, scenarios that deal with forensic nursing principles can be built into existing courses. This permits students and new graduates to expand their nursing competencies. With this added information, students can assist in recognizing and documenting injury patterns, identifying and preserving gunshot residue, or implementing policies to preserve biological specimens in case of suspected toxicological death.

As a growing number of nursing programs and hospital orientation programs employ simulations in training, scenarios can focus on the role of the nurse in a forensic application. In this era of cost consciousness in the hospital setting, the nurse is often the most logical person or the first line of opportunity for documenting and preserving forensic evidence. In fact, the nurse may be the only person available for this documentation. This type of role responsibility is portrayed in the simulation. Thus the student nurses learn practical implementation of forensic science in an intra-professional setting as they also learn wound

care and other medical-surgical procedures. These simulations are distributed throughout the three to four semesters of nursing education, beginning with physical assessment courses and continuing through senior level courses where students learn to deal with death and dying and patient care in hospital emergency and other high acuity settings. In the last semester of training, seminars focus on forensic knowledge that permit attendees to learn about recognizing, collecting, preserving, and documenting evidence; supporting sexual abuse survivors; and working with forensic pathologists; medicolegal death investigators; and law enforcement personnel. When the simulation scenarios and simulations are pulled together in a package, they also provide continuing education units to Registered Nurses (RN). In addition, this focus on forensic nursing through simulation provides basic training for RNs needing certification that will enable them to actively participate in a forensic nursing team. The presentation will include our initial experiences with this curriculum and some early outcome data.

Forensic Science, Forensic Nursing, Undergraduate Nursing Curriculum

D3 The Need for Mandatory Continuing Education for Forensic Science Professionals

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After attending this presentation, attendees will understand the need for mandatory continuing education requirements for any person practicing in the field of forensic science.

This presentation will impact the forensic science community by highlighting the importance of continuing education for all forensic science practitioners.

Other professions such as doctors and lawyers have continuing education requirements that are mandatory in order to continue practicing in the field. The information presented will show that continuing education should be mandatory in the forensic field like other professions because the level of knowledge across the different disciplines is ranging due to the lack of continuing education available. Some continuing education for forensic professionals is currently offered, yet the cost and availability may cause some professionals to not be able to attend

Based on data gathered from over 1,000 forensic practitioners at four training programs over three years, the continuing professional education needs of the forensic industry are going unmet. The forensic science community is interested in gaining more knowledge and training, but opportunities for this education vary greatly. For example, some professionals were able to attend five different training programs in one year while others were only able to attend one; this does not account, of course, for those who were not able to attend any. Also, professionals had to use personal time off or personal funds to attend continuing education opportunities. Gathering data from professionals employed by agencies with differing training resources was important because the data reflects the range of continuing education courses being received by forensic professionals and how attendance was funded for these and other programs.

In the National Academy of Science report, *Strengthening Forensic Science in the United States: A Path Forward*, the need for forensic science continuing education was emphatic. No mandatory standardized continuing education requirements exist in the forensic industry. Although, individual certifying or accrediting bodies may require continuing education, these are not universally accepted, even within specific disciplines. If all forensic scientists were required to gain a certification or license in order to practice their profession, mandatory continuing education should be part of the certification or license renewal process.

Mandatory continuing education for professionals is achievable; doctors, teachers, and lawyers are required to obtain continuing education to retain their licenses or certification. Continuing education requirements vary by state but some are national. The same could hold true for forensic professionals. As a science-based industry, the continuing development and attainment of knowledge and skills is critical to assure forensic work is being performed correctly and accurately using validated techniques and standards. By requiring all forensic scientists to gain a set number of hours of continuing education every year, for example, the entire field of forensic science would be strengthened.

After compiling the data from four continuing education programs, reviewing other professional groups' continuing education requirements and reviewing *Strengthening Forensic Science in the United States: A Path Forward*, the need for mandatory forensic science continuing education is clear. By pursuing mandatory continuing education, professionals need to agree on what requirements are most important to the field. With industry consensus, policies by local and national agencies could follow the guidelines and funding agencies could then assist with sponsorship and resources.

Continuing Education, Training, Professional Development

D4 Determination of Animal Law Enforcement's Capability to Conduct and Manage a Dog-Fighting Investigation and Recommendations for Identified Deficiencies

Dena M. Mangiamele, DVM, Animal Legal & Veterinary Medical Consulting Service, Inc., 10725 Atrium Drive, San Diego, CA 92131*

After attending this presentation, attendees will learn about the origins of the blood sport termed dog fighting, learn that successful prosecution of these cases is important because commission of this felony crime has been proven to be a precursor to more serious crimes, understand the current status of animal law enforcement's capability to conduct and manage a dog fighting investigation, and be provided with creative recommendations for identified deficiencies in investigative practice and management of dog fighting cases that can be useful to animal law enforcement, animal care staff, and prosecutors.

This presentation will impact the forensic science community by emphasizing the importance of successful investigative practices and case presentation of the felony crime of dog fighting (animal cruelty). It is crucial that all law enforcement and animal sheltering agencies investigating these cases are knowledgeable and well trained in up-to-date forensic techniques in order to successfully prosecute these cases which could potentially prevent future progressive adult violence.

This paper answers the question, "How prepared is animal law enforcement to conduct and manage a dog-fighting investigation?" A Knowledge/Attitudes/Practices survey was developed and administered to national dog-fighting experts who have past experience working with animal law enforcement in the capacity of field investigators, specialty shelter veterinarians, and local prosecutors and ranked animal law enforcement's capability to conduct and manage a dog-fighting investigation. The survey questions explored three main areas: (1) preparation prior to crime scene investigation; (2) techniques of crime scene investigation; and, (3) post-investigation case management. Each area focused on specific practices and skill sets. Experts categorized these skill sets in a 1-5 ranking, with 1 indicating total competency in that area. The analysis of all expert responses revealed that animal law enforcement agencies have deficiencies in each of the three phases of the investigative process.

Research was conducted on the availability of advanced training and continuing education opportunities for animal law enforcement in

dog fighting investigative skills and case management. It was discovered that there were few opportunities for officers in this specialty. As a result of these findings, the most effective recommendation to improve investigative techniques performed by animal law enforcement in dog-fighting cases would be to develop and distribute a Dog-fighting Investigation Manual for Animal Law Enforcement as the training tool of choice. Supplemental to the manual, instructional videos should be created and used in training conferences that could be organized and scheduled throughout the country.

Survey findings also indicated that collaboration among agencies is a key factor to successful prosecution. With this in mind, the recommendation of a written manual and training conferences becomes even more effective when it is structured to integrate local law enforcement, animal care staff, veterinarians, and prosecutors.

At the end of the presentation, examples of the current progress of implementation of the recommendations will be shared with the attendees. Instructional videos in dog fighting investigation will be viewed in correlation with the investigative manual manuscript that is currently being reviewed for publication.

Dog, Fighting, Investigation

D5 Characterization and Testing of Canine Training Aids for Forensic Victim Recovery Investigations

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After attending this presentation, attendees will have a better understanding of the challenges facing forensic canine specialists in today's world. There are several key challenges that need to be addressed, particularly the consistent or appropriate training of victim recovery canines across the community. If canines can be trained using a common training aid, the overall consistency of results should improve.

This presentation will impact the forensic science community by expanding the core group of people aware of these issues, which in turn may lead to faster and/or better research and development to address these key issues. Of equal importance is the benefit of having well trained, efficient canines that are consistently able to locate clandestine burials (i.e., human remains) and provide case related information, as well as some measure of closure for the families of these victims.

The use of canines in law enforcement and military applications is well-known. Canines are used to screen for drugs and explosives, to locate missing persons, to associate crime scene evidence with a suspect, and to locate victims of violent crimes. To do this, these canines require extensive training and conditioning. This training includes many facets, one of the most important of which is the use of training aids. In most of the situations listed above, standard training aids have been developed that can be used by the canine community and these training aids have been proven very successful for training canines. Of the group listed above, training aids for locating clandestine burials is of keen interest. The community of so-called victim recovery canines is quite diverse and not very well organized and training aids can vary widely. Some handlers acquire human tissue, human bone, human blood, "other"

cocktails, or one of a very few commercially available products. However, agreement over which training aid is the best to use for a given situation is lacking. The commercially available training aids offer the greatest potential advantages because they can be acquired by canine handlers across the world, which would help to standardize how the canines are trained.

For a training aid to be effective, it must very closely simulate the actual material that the canine is attempting to locate. In the case of human remains, this is not a simple task. There is some research that describes what volatile compounds have been found emanating from human remains. However, there are a number of factors that influence what compounds might be detected at the site of human remains: time since death, disposition of the body (surface, buried, or submerged), environmental factors, influence of scavengers, etc. As such, developing a training aid that can account for all of these variables is quite challenging. It is also possible that one training aid will not be sufficient to address all of these variables and canine handlers will have to use training aids that target the general conditions in which they find themselves at the time of their search. This presentation describes the characterization of commercially available training aids and the initial attempts at developing a training aid based upon current research activities in our laboratory.

Several different analytical approaches have been utilized to characterize the commercially available training aid formulations studied here. The basic approach involves collecting air samples from the training aids and analyzing those samples using gas chromatography with mass spectrometric detection (GC/MS). Air samples are collected primarily because they are the most relevant to canines. In this research, air samples have been collected and analyzed using thermal desorption methods, cryogenic methods, and solid phase microextraction (SPME). Preliminary results show how commercial training aids contain very few (i.e., <3) of the chemical signatures previously found to be associated with buried human remains. For the development of a new training aid, data from past research was utilized that identified 33 headspace components found above the sites of buried human remains. Mixtures of these compounds were then prepared and tested using canines to determine if positive responses could be achieved.

Canine, Clandestine, Burial

D6 Blunt Force Trauma Patterns in Suspected Animal Abuse Cases

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After attending this presentation, attendees will gain a better understanding of the value of forensic anthropological assessments in investigations of animal abuse. The goals of this presentation are to highlight blunt force trauma fracture patterns among canid skeletons and to discuss the value of detailed trauma assessment in animal abuse investigations.

This presentation will impact the forensic science community by providing awareness of perimortem trauma patterns from suspected animal abuse cases, and will highlight novel areas where forensic anthropologists can contribute to medico-legal investigations.

In October of 2009, the California State University, Chico Human Identification Laboratory (CSUC-HIL) was consulted by law enforcement to search the side yard of a private residence in northern California. The property contained the remains of several pets suspected to have died under suspicious circumstances. The recovery team located three shallow gravesites and excavated the remains of four domestic canids (*Canis familiaris*). The decomposed remains were transported to the CSUC-HIL for inventory and analysis. Investigators provided

antemortem documentation to assist in individuating each canid, which was confirmed through assessment of sex (e.g., presence/absence of a baculum), age (epiphyseal union, dental development, dental attrition), bone size, craniofacial morphology, and fur coloration pattern.

The remains were photo-documented prior to the removal of adhering soft tissue and fur through maceration. Each skeleton was laid out in anatomical position and analyzed with the assistance of two zoo archaeologists and a veterinary pathologist. The presence/absence of a baculum identified two of the canids as male and two as female. Three of the canids were skeletally mature and one was juvenile based on dental eruption and epiphyseal union sequences. These findings are consistent with antemortem records and witness statements provided to law enforcement. A detailed trauma assessment identified perimortem blunt force trauma (BFT) on all four canids.

Canid #1 shows evidence of BFT on the craniofacial skeleton, thorax, vertebral column, and metacarpals. On the skull, there is a circular depressed fracture along the midline at the intersection of the parietals and the occipital. A radiating fracture propagates from this impact site along the sagittal suture, and then terminates on the left side of the frontal. The left hemi-mandible shows evidence of a “butterfly” fracture on the medial aspect. Peri-mortem fractures were observed on several ribs, a spinous process of a vertebra, and on left metacarpals III-V. Well-healed fracture calluses were also observed on five left ribs.

Canid #2 shows evidence of BFT on the craniofacial skeleton, the thorax, the vertebral column, and the pelvis. Both zygomatics exhibit peri-mortem fractures. BFT of the nasopalatal region is associated with a linear radiating fracture that propagates into the lateral squama of the left parietal, terminating at the temporal line (Impact #1). In addition, there is a fracture to the left side of the cranium, which displaced bone endocranially (Impact #2). There are additional peri-mortem fractures of multiple ribs, one vertebral spinous process, and the left pubis.

Canid #3 shows evidence of BFT of the pelvis. The innominate was fractured along the midline (at the pubic symphysis), and a fracture propagates into the dorsal aspect of the left iliopubic ramus. No other evidence of trauma was observed.

Canid #4 shows BFT of the left thorax, which involved three ribs. No other evidence of trauma was observed.

Although all four canids exhibited BFT, the pattern of involvement varied substantially. Canids #1 and #2 showed extensive trauma to the head, including depressed cranial vault fractures, as well as numerous rib fractures. Appendicular fractures were only observed on the left metacarpals of Canid #1. Canid #3 and #4 showed less traumatic involvement, represented by pelvic and rib fractures, respectively. In summary, the distribution of BFT is consistent with reported cases of animal abuse. Injuries to canids commonly involve the craniofacial region and the thorax and pelvic area, and less commonly occur on the appendicular skeleton.

Forensic anthropologists are uniquely suited to assist with animal abuse investigations because of their advanced knowledge of skeletal anatomy and ability to analyze traumata on the skeleton. However, trauma assessments of non-human animal skeletons provide unique challenges, such as morphological differences in anatomical features, inter-specific variation in areas of buttressing, and differences in bone density. A multidisciplinary approach involving expertise from veterinary pathology and zooarchaeology is essential for accurate reconstruction of trauma to the nonhuman skeleton. These case studies highlight new areas where forensic anthropologists can contribute to medico-legal investigations.

Animal Abuse, Blunt Force Trauma, Forensic Anthropology

D7 Advancing Fire Debris Analysis through Chemometrics: An Overview of Research at the National Center for Forensic Science

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The goal of this presentation is to describe the chemometric methods currently being studied at the National Center for Forensic Science for the analysis of fire debris data and to show how the methods can assist the analyst in their casework.

This presentation will impact the forensic science community by raising the awareness of research efforts to introduce new mathematical approaches to the analysis of fire debris which facilitate the detection of ignitable liquids in the presence of interfering pyrolysis products, allow for rapid searches of ignitable liquid and pyrolysis product libraries, and support the use of probabilistic classifiers.

Current practice in fire debris analysis often relies on ASTM-E 1618-06, which defines a standard method for ignitable liquid residues analysis and classification in extracts from fire debris samples using gas chromatography-mass spectrometry. Identification of the presence of ignitable liquid residues is accomplished by the analysts' recognition of chromatographic profile patterns and target analytes. Laboratory-to-laboratory variations in chromatographic conditions can complicate the automated search of large databases and libraries that are shared between laboratories. Covariance maps of the chromatographic data and the total ion spectrum (TIS) are chromatography-invariant for a given set of analytes and therefore form the basis of robust pattern recognition and classification methods which allow spectral libraries to be searched for the identification of an unknown.

Ignitable liquid identification challenges resulting from sample contamination with pyrolysis products can be overcome by target factor analysis of a set of spectra, each containing differing contributions from ignitable liquid residues and pyrolysis products. Target factor analysis reduces the dimensionality of the dataset, producing a set of latent variables that do not necessarily resemble the spectrum of a single component in the fire debris. The abstract solutions can be tested one at a time to determine if an oblique rotation (to an angle other than 90° with respect to the latent variables) can lead to a vector that correlates strongly with a known spectrum obtained from a library. When this procedure is applied to a set of spectra of known ASTM classification comprising a library, the resulting correlations allow for the use of several probabilistic classification techniques to identify classes of ignitable liquids potentially present in the samples.

Analysis of a large set of total ion spectra from ignitable liquids (greater than 450 samples) and a set of spectra from pyrolysis products (greater than 50 common building materials) has demonstrated that the data from each set can be independently modeled and new samples correctly classified with a high degree of accuracy as either resulting from an ignitable liquid or a substrate. Further classification of ignitable liquid data to the correct ASTM class is less accurate and the correct classification rate is significantly reduced when the miscellaneous and oxygenate classes are included. The use of other chemometric methods for the implementation of hard and soft classifiers will also be discussed.

The chemometric methods are applied to datasets resulting from laboratory burns, large scale burns of furnished 20'x8'x8' containers designed to replicate structure fires, and from libraries of hundreds of commercially available products that are highly flammable. This presentation will provide detailed information about ongoing research conducted at the National Center for Forensic Science. Large scale burns were performed in collaboration with the Bureau of Fire Standards

and Training, Ocala, FL, and the Bureau of Forensic Fire and Explosives Analysis, Tallahassee, FL.

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Chemometrics, Fire Debris, Factor Analysis

D8 Dating Spores With the Carbon-14 Bomb Pulse

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After attending this presentation, attendees will understand how biological materials produced in the past 55 years can be dated using the carbon-14 (^{14}C) bomb-pulse. Attendees will learn how the carbon-14 (^{14}C) content of biomolecules serves as a chronometer of synthesis between 1955 and the present.

The presentation will impact the forensic science community by showing how a recently produced bioagent can be distinguished from one drawn from a historical archive.

Investigators of bioagent incidents or interdicted materials need validated, independent analytical methods that will allow them to distinguish a recently made bioagent sample from material drawn from the archives of a historical program. Accelerator mass spectrometry (AMS) precisely measures $^{14}\text{C}/\text{C}$ concentrations in biological materials and has been used to date the synthesis of biomaterials over the bomb pulse era (1955 to present), fulfilling the law enforcement need to place bioagents in a chronological context.

Atmospheric testing of nuclear weapons during the 1950s and early 1960s doubled the concentration of ^{14}C in the atmosphere. After cessation of atmospheric tests in 1963, the level of $^{14}\text{CO}_2$ has decreased with a mean life of about 16 years, not due to radioactive decay, but due to mixing with large marine and terrestrial carbon reservoirs. The temporal variations of artificially high levels of atmospheric ^{14}C have been captured in organic material world-wide and thus offer an opportunity to determine a date of synthesis for biomolecules. Since ^{14}C is incorporated into all living things, this bomb-pulse is an isotopic chronometer of the past 55 years. The enhanced level of ^{14}C worked its way up the food chain from CO_2 so that all living things were labeled with the pulse.

The concentration of $^{14}\text{C}/\text{C}$ was measured in a variety of media, *bacillus* spores, and separated proteins from *bacillus* spores. Bacteria convert the carbon in their food sources into the biomolecules they need, just like plants and animals. The ^{14}C concentration of *Bacillus* spores reflects the radiocarbon content of the media in which they were grown. The incorporation of the food source isotopic signature occurs if the media is primarily carbohydrate (e.g., high glucose), primarily protein derived (excess nitrogen), or a blend. In a survey of commercial media we found that the ^{14}C concentration indicated that carbon sources for the media were alive within about a year of the date of manufacture and of terrestrial origin. Hence, bacteria and their products can be dated using their ^{14}C signature.

Bacillus spore samples (BSL1, biosafety level 1) were obtained from the LLNL archive as well as generated on site. The standards were

B. thuringiensis kenya spores (Bt ken, control spores) generated onsite with defined media and carbon free purification; The test samples include *B. thuringiensis israelensis* (Bti), *B. globigii* (Bg), and *B. thuringiensis kurstaki* (Btk) from the LLNL archive. The archive spores were produced and purified by means unknown to the researcher performing the extraction, in order to mimic real world specimens. The archived spores were contaminated with petroleum-derived carbon from solvents and detergents used during processing. Using a mechanical lyser and a variety of washes with carbon free KOH, HCl, and HOOH, contaminant carbon was removed from soluble proteins. Samples were dried and combusted to CO_2 . The evolved CO_2 was purified, trapped, and reduced to graphite in the presence of iron catalyst in individual reactors. Graphite targets were measured for ^{14}C content by accelerator mass spectrometry.

Soluble proteins were purified sufficiently for accurate ^{14}C bomb-pulse dating. The insoluble fractions could not be cleaned using our procedures. Since media is contemporary, ^{14}C bomb-pulse dating of isolated soluble proteins can be used to distinguish between historical archives of bioagents and those recently produced.

This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory.

Bomb Pulse Dating, *Bacillus* Spores, Protein

D9 The Topic of Anchoring When Determining Likelihood Ratios in Fingerprint Comparison

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After attending this presentation, attendees will understand the importance of correct conditioning when determining likelihood ratios in fingerprint comparison.

This presentation will impact the forensic science community by illustrating the importance of correct conditioning when determining likelihood ratios in fingerprint comparison.

Following recent challenges in court on fingerprint evidence evaluation, statistical research on this topic has become more and more important. The question is how to evaluate the strength of evidence for the similarity of high-quality, rolled fingerprints, and low-quality fingermarks, which may be distorted, partial, or smudged. The similarity is based on the comparison of discrete characteristics (such as general pattern of prints and marks) and continuous characteristics (such as the minutiae, level II characteristics of the finger denoting locations and orientations of ridge endings and bifurcations). The Likelihood Ratio, or LR, is a statistical measure of the strength of the similarity, defined as:

$$\text{LR} = \frac{\text{Pr}(E | H_p, I)}{\text{Pr}(E | H_d, I)}$$

Here $\text{Pr}(\cdot)$ indicates the conditional probability of an event, E the evidence (some expression of the similarity between marks and prints), H_p the hypothesis that the mark and print have a common origin, H_d the hypothesis that this is not the case, and I all relevant background information (such as tactical information). Evaluation by LRs yields an objective measure of the strength of evidence, as opposed to assessment by expert opinion (which is basically subjective). In the current study, the focus is on the impact of different ways of conditioning numerator and denominator of the LR on the numerical result.

In two papers by Neumann et al (J.For.Sci., 2006, p.1255-66, 2007, p.54-64), an analysis is given for LR computations based on the general pattern of print and mark, the number of minutiae on the mark, and the similarity of the minutiae configurations. A Euclidian distance is used to quantify similarity of the minutiae configurations. In Egli et al

(For.Sci.Int., 2007, p.189-95), the similarity between marks and prints is determined by an automated fingerprint identification system (AFIS), and LR's are evaluated based on prints made by one fixed thumb. Moreover, a simulated case study is performed with a fingermark containing 10 minutiae, leading to an LR of 85.6 million. This finding indicates that high LR values can be attained for fingermarks that in most countries would be unusable in court since the number of minutiae is too low.

For forensic application, it is important to know whether the reported LR's are accurate and robust. It turns out that within-source variability of similarity scores may differ for different fingers, even from the same donor. Next to this, the distribution of between-source similarity scores may depend on the fact whether a fixed mark is compared to a non-matching database of prints, whether several marks of the same finger are compared to one fixed fingerprint, or to several marks of different fingers, etcetera. The above is closely related to the topic of "anchoring" of evidence (which can be suspect anchored, crime scene anchored, or not anchored at all). In Neumann et al, it is unclear what conditioning is used to obtain distribution for the within – and between – source variability. In Egli et al, both in the numerator and the denominator the LR is conditioned on the number of minutiae of the mark. However, the conditioning is asymmetric in the sense that for the within-source variability comparisons are used of multiple marks with multiple prints of a fixed finger, whereas for the between-source variability comparisons are used of a fixed mark with multiple prints of databases of non-matching prints.

The results of the current study, which uses similarity scores generated by an AFIS system, show that there is a considerable effect of both the particular finger, and of any particular reference print used on the distribution of within-source similarity scores. This illustrates that there is a choice to condition either on a particular reference print of the suspect, or on several reference prints. Whatever the choice is though, it has to be used both for the numerator and denominator of the LR formula. The resulting LR's may be quite different from the ones obtained when using non-symmetric conditioning in numerator and denominator of the LR formula.

Bayesian Approach, Anchoring, Fingerprint Comparison

D10 Blended Learning – An Effective Approach to Training for Forensic Science Disciplines

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After attending this presentation, attendees will understand the blended learning approach to forensic training and the benefits of this model, such as reducing costs and reaching more practitioners with state-of-the-art training.

This presentation will impact the forensic science community by describing how the blended learning model is a highly effective approach to forensic science training. The online environment provides many benefits to stakeholders, including best value for training delivery, collaborative learning environments, consistent content, secure access and randomized testing capabilities. In addition, robust reporting features provide comprehensive reports on performance metrics. When combined with the hands-on, scenario-based activities in the classroom, this approach to training can be a highly cost effective alternative that promotes peer interaction and produces well-trained, highly proficient forensic practitioners.

Reduction in training budgets requires agencies to carefully consider options that maximize training opportunities while minimizing cost. This presentation will provide information on the blended learning approach to forensic science training and the benefits of this model, such

as reducing costs and reaching more practitioners with state-of-the-art training.

From training members of the U.S. military to preparing forensic practitioners who work in publicly funded crime laboratories and law enforcement agencies, the National Forensic Science Technology Center (NFSTC) educates professionals on the front lines of ensuring public safety. To broaden the availability and reduce the cost of training, the NFSTC often uses a blended learning model that combines web-based distance learning with onsite instruction and hands-on activities. The distance learning component maximizes class preparation, assessment activities and learning results, while the complementary classroom-based training uses realistic scenarios that allow trainees to practice their skills in real-world situations.

The NFSTC maintains a web-based Online Learning System (NOLS) that supports blended learning by serving as a virtual learning community that includes program information, course content, resources, discussion forums, communication tools, surveys and autograded testing. Before and after each classroom session, participants complete online work through NOLS to master basic subject area knowledge or to reinforce and apply skills learned through classroom instruction, discussions, demonstrations and hands-on activities.

NFSTC's delivery of two *Latent Print (LP) Examiner Training* programs provides an example of forensic science training that was developed using the blended learning model. Offered at no cost to entry-level examiners, the selection process includes an online interactive visual acuity test. The program combines classroom training, online distance learning and practical exercises and is designed to help prepare trainees to successfully meet the challenges of certification examinations provided by the International Association for Identification (IAI).

This comprehensive, 11-course *Latent Print Examiner Training* program provides each trainee with more than 380 hours of classroom-based training over an 8-month timeframe. An additional 6 to 10 hours of online pre- and post-coursework is assigned for each of the 11 courses, providing an average of 88 hours of web- and practical-based instruction. Five 2-week classroom-based sessions are held at the NFSTC facility in Largo, FL. Between sessions, trainees complete online reading assignments, exercises and assessments in preparation for the next classroom-based training session. During the two years that these programs have been offered, the NFSTC has trained a total of 33 practitioners in the latent print examination discipline.

The most recent graduating class achieved average grades of 97.25% on individual course assessments and 93.78% on the comprehensive program assessment. In a three-part mock certification exam, grades averaged 98.4 %, 86.4% and 76.8% for each individual component. Trainees also participated in a video-captured moot courtroom testimony experience.

The blended learning model is a highly effective approach to forensic science training. The online environment provides many benefits to stakeholders, including best value for training delivery, collaborative learning environments, consistent content, secure access and randomized testing capabilities. In addition, robust reporting features provide comprehensive reports on performance metrics. When combined with the hands-on, scenario-based activities in the classroom, this approach to training can be a highly cost effective alternative that promotes peer interaction and produces well-trained, highly proficient forensic practitioners.

Distance Learning, Forensic Training, Blended Learning

D11 A Forum on Forensic Science Education: Do University Forensic Science Education Programs Meet the Needs of Forensic Laboratories and How Can Forensic Laboratories and Universities Work Together to Improve Forensic Science Education and Practice?

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After attending this presentation, attendees will be informed of the issues discussed during a recent forum on the collaboration between crime laboratories and university forensic science education programs.

This presentation will impact the forensic science community by expanding the awareness of forensic science educators and crime laboratory managers and bench workers of different ways in which academia and the working professional community can interact and collaborate to improve the education of forensic scientists and the quality of work done in the forensic science field.

The Midwest Association of Forensic Scientists and the Midwest Forensics Resource Center held a forum on forensic science education, June 15-17, 2010 in Indianapolis, Indiana. It asked: "Are university forensic science education programs meeting the needs of forensic science laboratories?" and "How can forensic laboratories and universities work together to improve forensic science education and practice?"

The Forum's discussion-leaders included:

- Forensic laboratory directors.
- Recent graduates of university forensic science programs working in forensic laboratories.
- Forensic scientists employed in crime laboratories who also instruct in university programs.
- University administrators, instructors and researchers.

Nineteen of the forty participants were from municipal, county, state, and federal forensic laboratories and twenty-one were from university forensic science programs.

Forum discussion was frank. Afterwards, participating educators reported making curriculum and instruction changes on the basis of forum discussion, and participating forensic laboratory administrators reported new collaborations with university forensic education programs. The dominant suggestion in the participant-evaluations was to establish a continuing forum.

The forum consisted of sessions during which three-member panels (each panel representing a participant group) addressed the topic-question from experience. Each 45-minute stimulus-session was followed by a 45-minute interactive discussion. Panels and discussions on the final morning addressed the potential for collaboration in curriculum improvement and forensic science research. For example:

Participating forensic laboratory directors expressed concern that college and university forensic science education credentials do not help when make hiring decisions.

One laboratory director participant asked the forum to consider the situation of a forensic manager seeking to hire a recent university graduate. He or she wants a candidate with several general characteristics:

- Good writing and speaking skills.
- Logic and reasoning skills.
- Ethics and morals.
- Inquisitiveness.

- A bachelor's degree (indicating significant laboratory skill and experience, a grasp of science and scientific method, and topical knowledge in chemistry or another lab science)

The participant reported investing significant time and effort to assess points 1 through 4 directly (because university credentials do not/cannot document these effectively). It was also reported the investment of significant time and effort in assessment of university degrees.

This participant stated that the proliferation of forensic science programs complicates the hiring process with its plethora of "qualifications" which was illustrated with excerpts from applications that documented over 60 different forms of university qualification, including: forensic science workshops, training, certificates, institutional awards, associate's degrees, bachelor's degrees, master's degrees and doctorates.

Forensic scientists who also instruct in university education programs, expressed concern that college and university forensic science education programs ignore critical components of forensic practice.

One panelist noted that universities seem more-oriented toward forensic programs that correspond to their already-existing university departments (like DNA and forensic chemistry) than to other forensic disciplines, like trace evidence, firearms and tool marks, impression evidence, questioned documents, photography, and/or digital evidence.

This presenter suggested that university programs and their graduates could benefit from a Courtroom-testimony-cum-public speaking course positioned early in the curriculum. He also proposed a class addressing the scientific method in forensic science.

A second panelist noted that some university programs fail to meet routine ethical standards. The panelist documented cases in which a university forensic science program was reluctant to fail students on tests and from classes in which they were caught cheating. Several more-serious ethical lapses were also documented.

Recent graduates of university forensic science programs now working in forensic laboratories said that university forensic science education programs failed to address knowledge critical to their work.

One participant had graduated from an ASC-accredited BS chemistry program with a forensic science emphasis. He described his academic program as heavy on theory and basic science. He noted that his daily on-the-job challenge was to apply science to specific cases and said that he had not practiced the application of science at the university.

He also felt his university education had not adequately addressed:

- Scientific quality assurance
- Forensic ethics
- Reproducibility
- Writing skills
- Verbal communication skills

This speaker was being trained as a firearms examiner, and further noted that firearms, fingerprints, footwear, tire tracks, pattern matching, and trace evidence were largely absent from his university and undergraduate program.

Administrators and staff from forensic science education programs described their programs and their response to university demands in the development and administration of them.

Several speakers described how they have structured programs in response to interactions with crime laboratory directors and staff, and the work they do to systematically implant forensic content into existing university classes and programs. However most said that laboratory concerns were secondary to traditional university curriculum development issues.

In response to laboratory requests for assistance in protocol development and validation studies, several mentioned that these forms of research do not really contribute to faculty promotion or tenure, and are not considered sufficient for master's degree projects. In response to requests for fundamental research into forensic science, one noted that

these are not commonly funded; that they may take many years to complete; that the academic audience for such studies is restricted, and that few upper tier journals are oriented to the publication of such studies.

Education, Laboratory, Collaboration

D12 Genetic Influences on Count and Distribution of Forks and Ridge Endings in Fingerprints

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The goal of this presentation is to investigate whether fingerprint minutia, a type of detail used in fingerprint identification, is influenced by heredity.

This presentation will impact the forensic science community by contributing to the understanding of fingerprint uniqueness.

This research is accomplished by comparing the number and distribution of forks and ridge endings (the two most fundamental types of minutia) in the fingerprints of 151 biologically related British adults from eight different families to those of 304 unrelated British adults.

Several prior studies have suggested a strong genetic component to the number of minutiae in fingerprints, as evidenced by strong correlation coefficients between family members and monozygotic twins. The relationship between heredity and minutiae distribution has been largely unexplored.

In this study, fingerprints were collected either by rolling, inking, and printing on high quality white printer paper, or by using black powder and white adhesive labels affixed to a plastic transparent sheet. The prints were then scanned into digital format at 12,000 dots per inch resolution.

The portion of the fingerprint examined consisted of a square grid positioned over the center, or core, of the fingerprint pattern, which was further subdivided into four quadrants. First, the core of the print was marked. Next, a gridline distanced 10 transecting ridges from the core was placed. That distance was then used as the basis for a square grid placed over the fingerprint to define the sample area. The number of ridge endings and of forks occurring in each quadrant of the grid was recorded for each fingerprint.

Chi-square tests comparing the variation in total minutiae for the 8 family groups were statistically significant ($p < 0.001$) (expected values were calculated from the control sample). Analysis of variance tests comparing the number of minutia occurring in each of the four quadrants in the eight families to the quadrant data for subsets of the control sample was not statistically significant, either when the minutiae counts were considered as a whole, or when forks and ridge endings were considered separately. No individual in the study presented less than one fork, less than one ridge ending or fewer than four total minutiae in the central portion of their fingerprints.

The results of this study indicate a genetic influence on the number of forks and ridge endings in fingerprints, though not necessarily on their distribution. There is more similarity in the number of minutiae occurring in the fingerprints of individuals from the same family than would be expected if compared to an unrelated individual. This study found no familial correlation in the distribution of minutiae, though distribution was examined only narrowly in this study, in terms of quadrants of the fingerprint, but not in terms of proximity to the core or to other minutiae for example. Also of note, is the finding that the fingerprints of adult individuals display a minimum number of forks and ridge endings.

The validity and reliability of fingerprint identification in the United States, when carried out by a qualified latent print examiner is largely unquestioned, though it has occasionally been challenged under

the *Daubert* standard. Despite the wide acceptance of identification from fingerprints, the ability to quantify fingerprint uniqueness would still be useful, for example in calculating a minimum number of corresponding points necessary for identification from fingerprints by matching minutiae, from both a legal and scientific standpoint.

Fingerprints, Minutiae, Heredity

D14 Detection and Prevention of Elder Abuse: A Pilot Study in Italy

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The goal of this presentation is to inform attendees about an emerging phenomenon of human dominance, the so called "elder abuse."

This presentation will impact the forensic science community by demonstrating an inadequate awareness of detecting and preventing violence against elderly people, primarily among health professionals, in Italy.

It is estimated that people over the age of 80 will be the fastest-growing group in Europe over the next decades, rising from 4% today to 11% in 2050 (V. Turkulov et al., 2007). Even though elder abuse in institutional and domestic settings is increasingly being recognized as a major social problem, it is still underestimated in Italy.

The abuse against elderly people includes several types of damages and situations. The most typical victims are those carrying particular risk factors such as poor general health, disabilities, dependence on others. Abuse may take many different forms: physical, psychological/emotional, neglect, financial, legal, or sexual. Elder abuse is often the result of a lack of adequate knowledge, overburdening, and stress on the part of professional and family caregivers alike.

The supposed lack of appropriate measures to protect elderly people particularly vulnerable to abuse led to a project with the goal of giving a better estimation of the phenomenon and consequently acting in order to prevent it.

Purposes of this study were to assess the significance of this social problem in Emilia Romagna and Liguria (the "oldest" Italian Region) and to understand the level awareness of juridical or medico-legal measures to be adopted in the case of elder abuse or neglect. This has been performed by distributing an anonymous questionnaire to health operators and other professionals dealing with elderly patients (geriatrists, E.R. doctors, general practitioners, nurses, physiotherapists, social service operators, professional caregivers).

The results of the study conducted in these two Italian regions showed the little emphasis given to this significant problem in Italian society. For improving legal and medical protection, a more specific medico-legal and clinical definition of the elder and a higher awareness and alertness of medical personnel involved in old people care are mandatory. A preventive action for the subjects with high risk factors could be carried out to stop repeated violence and chronic abuse.

The first step to prevent violence against elder people should be fostering the ability of recognizing forensic markers of elder abuse such as bruises, deficient nutritional status, dehydration, bad hygienic conditions, decubitus ulcers, broken bones, sharp wounds, and skin tears. These markers, right now, are too often ignored or underestimated. In this sense, the purpose of the study is to overcome the low level of knowledge through new multidisciplinary screening

tools as well as uniform and validated guidelines. Such an approach could be extremely helpful not only for doctors, but also for all professional care workers and generally for people in contact with elderly people.

Moreover, the evaluation and comparison of other legal systems that provide a definition and a specific protection of the elderly in different European countries are fundamental.

In conclusion, elder abuse is a widespread serious problem. It is recommended that both forensic and health operators become familiar with this phenomenon, especially those who are involved in old people care. A widespread training of health professionals, justice and social sectors is the only mean to increase the awareness of elder abuse and to create multidisciplinary teams, developing research in this field.

Elder Abuse, Multidisciplinary Approach, Forensic Markers

D15 An Evaluation of Digital Radiography and Multi Detector Computed Tomography (MDCT) in Gunshot Wound Trauma

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After attending this presentation, attendees will recognize the principle differences between Digital Radiography and Multi-Detector CT Scanning (MDCT). Attendees will understand the relative advantages and disadvantages of each method for the documentation and evaluation of soft and hard tissue trauma resulting from ballistic injury. A case study demonstrating the use of both methods in the investigation of ballistic trauma will be presented.

This presentation will impact the forensic science community by increasing awareness of the potential offered by modern medical imaging techniques and afford a greater understanding of their application in the investigation of ballistic trauma.

Although radiography has long been the primary method used to evaluate ballistic trauma, interest is increasing in the use of Multi-Detector Computed Tomography (MDCT). Recent studies have demonstrated significant advantages of this method over traditional film-based radiography. However, advances in detector and computing technology used in digital radiography now offer an alternative to traditional radiographic methods. The portability and lower capital cost of such units make this an attractive alternative imaging method in situations where MDCT is not possible for logistical or financial reasons.

A case study in which three experimental subjects (pigs, humanely killed) were subjected to postmortem gunshot trauma via a series of controlled ballistic discharges is presented. All subjects were examined both prior to and following shooting using MDCT and digital radiography. Following postmortem imaging, the subjects were examined using a conventional necropsy. Postmortem and antemortem image data from both modalities was evaluated by a team of Consultant Radiologists and compared to the necropsy findings.

Many studies have demonstrated the advantages of MDCT for evaluation of postmortem pathology due to its high resolution digital acquisition permitting both sectional and 3D reconstructions. In this study, MDCT proved very effective at demonstrating entry & exit wounds, projectile pathway and the extent of both temporary and

permanent cavity. However, in order to demonstrate and evaluate this information, a complex and time-consuming computer post-processing sequence is necessary, requiring specific specialist skills. Equipment is both large and expensive and may be outside the budget of many jurisdictions. However, in certain situations the additional information acquired may significantly reduce the time taken for autopsy, thus providing a cost-effective solution in busy jurisdictions.

Digital Radiography (DR) enabled both hard *and* soft tissue trauma to be recorded, documented and evaluated, offering significant advantages over its film-based predecessor. Radiographs were rapidly acquired to determine the presence or absence of underlying fractures and to establish whether any ballistic material remained within the soft tissue. Despite these advantages over conventional radiography, DR is not a 3D imaging technique and proved less effective at evaluating projectile pathway or bullet fragmentation than MDCT. It is also subject to errors of magnification and distortion and complicated superimposition. It is however, a more cost effective and simpler technique offering the user greater operational freedom and improved workflow, decreasing the overall postmortem examination time when compared to film radiography. It may be particularly useful in field applications due to its portability.

Both MDCT and DR are effective methods of evaluating ballistic trauma. While MDCT offers significant advantages in providing a 3D demonstration of soft tissue damage from entry to exit, it is a complex and time-consuming process. DR offers a rapid and effective primary tool for such investigations which is significantly superior to its film-based predecessor and less complex than MDCT. It may prove to be a more versatile option in many circumstances.

Multi-Detector Computed Tomography, Digital Radiography, Forensic Imaging

D16 Tracking Bullet Trajectories: A Comparison of Multi-Detector Computed Tomography and Magnetic Resonance Imaging

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After attending this presentation, attendees will understand that although radiography, either using film or a digital recording format, is currently the primary means for the examination of gunshot wound victims, interest has increased in employing advanced imaging modalities such as Multi-Detector Computed Tomography (MDCT) and Magnetic Resonance Imaging (MRI). Although vendors suggest the equipment is easily operated, a skilled technologist is required to manipulate the unit in order to obtain the optimal images. This presentation will consider optimizing protocols which will maximize image quality and, in addition, compare the advantages and disadvantages of MDCT and MR.

This presentation will impact the forensic science community by demonstrating how when operated by a skilled technologist, MR and

MDCT can be employed to produce complementary images of gunshot wounds. MR will demonstrate the soft tissue response to the forces created by the projectile. MDCT will more clearly visualize lead fragments from the projectile and resulting damage to bony structures.

Hypothesis: Both MDCT and MR provide excellent sectional images of anatomic structures. However, with each of the advanced imaging modalities, skilled equipment operators are necessary in order to manipulate the protocols necessary to generate the best obtainable images.

Synopsis of Content (Materials & Results): As part of a study to determine the effects of gunshot wounds on soft tissue and bone, three pigs were shot with two different caliber handguns and subsequently imaged using various imaging modalities including computed radiography (CR) and plane (conventional) radiography, Multi-Detector Computed Tomography (MDCT), and Magnetic Resonance Imaging (MRI). Prior to being shot, the animals were stunned using a "capture bolt" and then exsanguinated by via a throat slash. Because of the length of time necessary to acquire the MRI images, only one pig was imaged with all four imaging modalities including MRI and MDCT.

Conclusion: Compared to MDCT, MRI produces superior sectional images of soft tissue structures; however, specific parameters regarding slice orientation must be programmed prior to the initiation of the examination. Conversely, MDCT best visualizes bone and more dense materials that are not clearly demonstrated with MR. In addition, MDCT initially collects a volume of tissue that can later be reconstructed in virtually any plane and can also generate three-dimensional images with varying degrees of transparency.

Magnetic Resonance Imaging (MRI), Multi-Detector Computed Tomography (MDCT), Gunshot Wound Imaging

D13 Forensic Polygraph Testing: A Response to the Call for Strengthening the Forensic Sciences

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After attending this presentation, attendees will have a better understanding of how polygraph testing fits in the general forensic sciences. In addition, attendees will learn how practitioners of this forensic technique of polygraph testing, like a number of other techniques, struggle with the demand for better "science" and improvements in the credentials and training of practitioners.

This presentation will impact the forensic science community by presenting two points of information: (1) the polygraph testing community, as will be discussed in the presentation, has a strong historical connection to the forensic sciences, even though in many applications today may not be apparent to uninformed observers; and, (2) the recent reviews by the National Research Council (NRC) of the National Academy of Sciences, of polygraph testing and, then, of the forensic sciences, have promoted a strong and sustained interest in leaders in the polygraph testing community to attend to the call for a strengthening of the field in line with the NRC's recommendations. Attendees will learn how these recommendations are being addressed and what remains to be done.

The National Research Council (NRC) of the National Academy of Sciences (NAS) released a public report on polygraph testing in 2003 which was based on an extensive review of the available empirical research. The report was widely publicized and was generally considered critical of polygraph testing. The NRC's initial charge was to consider the use of polygraph testing in the context of personnel security screening, e.g. police and intelligence agency applicant testing

and government employee security clearances. However, after a review of the literature, it was determined that there was a significant lack of empirical evidence regarding the use of polygraph testing in screening applications. The NRC subsequently expanded their efforts to include "specific-incident testing," which involves the use of polygraph testing for forensic purposes, such as in criminal investigations. The NRC concluded that "specific incident polygraph tests can discriminate lying from truth telling at rates well above chance, though well below perfection." Additionally, the NRC provided commentary and recommendations regarding a number of additional issues in polygraph testing that needed attention. This included special emphasis on the need for more and better research, careful attention to the development of theory and theory directed research, and a strengthening of the "standardization" of the testing process. Though the 2003 NRC report had considerable influence on guiding some changes in the polygraph community, many of its recommendations were viewed with considerable skepticism, which likely occurred as a result of several issues noted by the polygraph community. One of the most important of these was that the NRC committee which was established to review the research evidence was comprised only of persons who had no interest or involvement in the polygraph testing community, whether as researchers, practitioners, or scholars who focused on the topic. In short, the committee lacked representative spokespersons with personal and professional experience in the field who could have balanced the strong, abstract considerations the committee focused on with specific concerns that arise in real-world application. Such input may have led to a report that was more influential than was actually the case in this instance. Unlike the NRC report on polygraph testing, the now widely known and highly influential 2009 Report on the forensic sciences by the National Academy of Sciences included a number of multi-discipline scientists and multiple persons with real-life experience in a number of forensic practices. This, has led to a report with far greater influence than the 2003 NRC report and, has led to a response to the more recent NRC report by leaders in the polygraph community that has a greater sense of direction and urgency, than was the case previously. The recommendations of the 2009 NAS Report will be discussed and consider them in relation to disparities among practitioners in the polygraph community. Concerns in the polygraph testing community about how to deal with enhanced research activities, accreditation of training facilities, certification of practitioners, quality control and other oversight mechanisms will be highlighted. Further, this paper will outline the significant changes that have already occurred in the field and the changes which are planned for implementation in the near future.

From this presentation attendees will have a better understanding of forensic polygraph testing and why, even though such testing may differ in nature from other forensic techniques, the difficulties and disparities in the polygraph examiner community are similar to those in other areas that were considered in the 2009 NAS Report. Furthermore, this presentation will provide attendees with information regarding the current state of the polygraph testing field and how its leaders intend to strengthen its role as a forensic science.

Forensic Polygraph, Polygraph Examiners, National Academy of Sciences

D17 A Case Study of a Murder Staged to Look Like a Suicidal Hanging: Focusing on the Small Details That Led to the Successful Resolution of the Investigation

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After attending this presentation, attendees will be familiar with the key investigative steps needed to successfully detect a staged crime scene. The benefits of not making a hasty judgment while conducting a death scene examination and preliminary investigation will be discussed. Keeping the focus of the investigation broadly to verify or rule out all possibilities will be espoused. A multidisciplinary approach to investigations is the key in obtaining outstanding results in the pursuit of the truth.

This presentation will impact the forensic science community by exposing participants to various key steps in solving some of the most difficult death investigations.

In late October 1992, a quiet military housing area was stunned by the apparent suicide of a 21-year-old army wife and mother of two small children. Military members represent all spectrums of our society. Military families often face extreme challenges that are unique that frequently cause stressors to build to the point of tragedy. Murder and suicide are sometimes the unfortunate outcome. The United States Army Criminal Investigation Division is chartered to investigate all unattended deaths on U.S. Army installations worldwide.

CID Special Agents responded to the scene and began documenting and processing the crime scene, processing the body, and interviewing friends, neighbors, and family members. The 23-year-old soldier reported his wife went upstairs to take a shower. After hearing the water run for an unusually long time he went to check and found her hanging in the nude from an electrical cord attached to the shower head. The soldier additionally reported his wife had made prior suicide attempts following the recent death of her mother and had a family history of depression. The body was taken to the North Carolina Medical Examiner's Office, Chapel Hill, NC, where an autopsy supported the asphyxial death of the wife. A review of her medical records supported the Soldier's allegation of the prior suicide attempt.

The soldier was allowed to take his wife to Texas to be buried and his children taken to their grandparents for long term care. Upon his return to duty nearly a month later, CID Special Agents conducted a thorough interview in which the soldier was confronted with inconsistencies between his statements, other interviews conducted and the evidence from the death scene. He subsequently confessed to getting into a fight with his wife during which she knocked herself unconscious. At that time he formed the plan to hang her from the shower to make it look like a suicide. He placed the electrical cord on the shower head and then hung his wife.

Murder, Hanging, Suicide

D18 If I Had a Hammer 2: Another Example of Improvised Firearm Construction and Use

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After attending this presentation, attendees will have a better understanding of improvised firearms. This presentation will illustrate the construction and firing of an improvised firearm from a suicide.

This presentation will impact the forensic science community by illustrating the use of commonly found items to construct a plausible and effective weapon.

Crime scene investigators work scenes that become almost too familiar to them in that there are similar facets that often repeat themselves depending on the scenario. However, occasionally scenes have something different that sticks out and attaches itself to that case from which it will forever be known to those involved.

Although there have been ways to manufacture weapons for many years, it is not often seen in practice. It is often thought by law enforcement that the removal of weapons will prolong the life of the individual expressing suicidal thoughts, thereby giving him or her time to be evaluated, receive treatment, and be released to friends or family that will take care of them. There are circumstances where law enforcement is asked to remove weapons under court order for fear the individual will do themselves or others harm.

Removal of weapons from the possession of someone with questionable intentions should increase the difficulty in actually harming themselves. Firearm "building" is a relatively simple yet illegal alternative to acquiring another weapon. The use of such improvisation demonstrates, in the case of a suicide, sheer determination on the part of the victim to end his or her life.

One such case involved pieces of metal piping, a live shotgun round, a nail, and a hammer. The shotgun round was held inside a piece of pipe using a metal coupling and fitting with a hole drilled in to the end the same size as the width of a nail. The hammer was used to strike the nail, thereby mimicking the action of a firing pin and discharging the round through the pipe which was held against the victim's chest. Because there was not an alternative route for the gases to escape, the result was exceedingly devastating to the upper left chest cavity.

The device was disabled by the hazardous device team using a percussive disruption device. In order to demonstrate the weapon construction, PVC pipe was used to build a scale model. The model was made two times larger than the original improvised firearm for three reasons: constructing a firearm is a federal offense, even if it is used for education purposes. There would not be ammunition available for this size on a civilian level. The PVC would not contain the "explosion" cause by the striking of the round, further proven by the emergency room injuries from the commonly constructed "potato gun."

This presentation will describe the circumstances of the scene, the evaluation by the crime scene investigator and the hazardous device team, and the reconstruction of the improvised firearm using materials that were legal and safe.

Crime Scene, Improvised Firearm, Suicide

D19 Towards Standards in Forensic Archaeology: Examining the Impact of Method on Interpretation

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The goal of this presentation is to demonstrate that different methods of excavation and recording systems applied to the same archaeological features result in different reported interpretations, and therefore reconstruction of events at crime scenes. The results may impact on how field archaeologists worldwide undertake excavations, apply methods and interpret their work.

This presentation will impact the forensic science community by demonstrating the assessment of the different methods used to excavate

archaeologically justifies the need to question and test methods used to collect evidence for forensic investigations. The level of confidence we can place in different methods is questioned.

Forensic science and the standards within its' various disciplines are under the spotlight and forensic archaeology is no exception. The National Academy of Sciences (NAS) Report 2009 highlighted the need for review, and the work of the Forensic Regulator of the Home Office in the United Kingdom developing standards within forensic science show the demand and active movement towards standards determination for forensic science disciplines.

Examination of standards in forensic archaeology, quantitative determination of accuracy of contrasted methods and critical assessment of the suitability of methods for forensic and legal cases has not been undertaken systematically. Excavation method is one of these and publication of research in this area began at Bournemouth University by Hanson in 2004. This has continued and accelerated, with an increase in contributors and data collected; Cheetham 2005; Wright, Hanson and Sterenberg 2005; Hanson 2007; Cox et al 2009; Cheetham and Hanson 2009; Wright and Hanson 2009; Hanson et al 2009, critically assessing excavation, management and practice and highlighting limitations in these areas.

Archaeologists and excavators have for too long described standard practice without an assessment of what this means and whether the methods used maximize data identification and recovery. The luxury of doing without such an assessment cannot be delayed when courts and legal cases have begun examining archaeological practice and standards are being set. Now is a critical time to conduct research that can contribute data to advise the working groups and regulatory bodies as to what standards should be set for archaeological excavation methods, recording and interpretation for forensic and legal purposes.

This paper examines archaeological and forensic case studies where interpretations have been questions and the "unrepeatable experiment" of excavation has been repeated with differing results. Experiments to test methods in a controlled manner have determined levels of archaeological and evidence identification and recovery differ depending on the methods used. Excavation of simulated and identical archaeological features was undertaken by a series of participants using two different excavation methods, which were compared: (1) stratigraphic excavation, as described in detail by Harris (1989) and Harris et al (1991); and, (2) arbitrary excavation described in detail and critically compared with the former method by Praetzellis (1991). The results showed that stratigraphic excavation provides a higher level of accuracy in evidence location and identification of archaeological contexts. They also suggest that levels of accuracy are dependent on practitioner experience and speed of excavation. Arbitrary excavation methods produce a common level of accuracy independent of experience, but this level is not accurate enough to provide confidence in this method for use forensic cases, other than in specific circumstances. This variation in results dependent on excavation method not only affects confidence in the nature and context of evidence recorded but also in the interpretations given and reported upon.

Forensic Archaeology, Excavation Methods, Standards

D20 Retaliation Against a Police Officer, or Not? A Case Study

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After attending this presentation, attendees will learn how to recognize signs of police retaliation at a crime scene and recognize clues that indicate staging of a crime scene. In addition, attendees will learn the importance of being aware of workplace events and how they may tie into future investigations.

This presentation will impact the forensic science community by showing the importance of recognizing clues at crime scenes that may or

may not point toward the original hypothesis regarding what occurred. Knowledge of the characteristics often seen at crimes scenes where there was police retaliation and crime scenes that were staged will be gained.

On a Sunday morning around 6:00 a.m., police were called to check an apartment where neighbors noticed there was an open door. Upon arrival, the police determined a burglary had occurred and crime scene investigators were called to process the scene. The burglary was located in a third floor apartment in a gated complex. When the CSI arrived at the scene, specific messages to the victim and a gang sign were observed written on the walls of the apartment. One message was obviously directed toward the police and was initially thought to be a message to responding officers. However, it was later determined that the victim of the burglary was a police officer who was on-duty at the time of the incident.

Because of the specific messages written on the walls, the condition of the scene and the time frame during which the burglary occurred, investigators initially hypothesized the burglary and vandalism was a result of retaliation against the police officer who occupied the apartment. Steps to ensure the safety of the police officer victim were immediately begun by the internal affairs and homeland security units. Detectives on scene canvassed the apartment complex and the victim officer's superiors were notified. In the meantime the roommate of the officer arrived on scene and was also interviewed by the detectives.

Throughout the scene investigation evidence that was inconsistent with the initial hypothesis of police officer retaliation was noticed. For example, several neighbors reported hearing three gunshots during the night, but no evidence of gunshots was found at the location. Additionally, while the incident had all the makings of a burglary, nothing appeared to be missing from the apartment. The officer's uniforms were intact and accounted for and there was not severe damage to any personal items (including weapons) located inside the apartment. Other hypotheses were suggested including a random occurrence of the burglar happening upon the officer's apartment and that juveniles living in the apartment complex committed the burglary. However, neither of those hypotheses fit the characteristics observed at the scene.

The crime scene was documented according to procedure and the investigation continued by detectives. Throughout the investigation more information regarding the history of the roommate's professional and personal life was gained and ultimately provided the clues needed to determine if the burglary was conducted by an offender retaliating against a police officer or by someone else. The keys to solving the investigation and reconstructing the crime scene were prior experience working retaliatory scenes and the knowledge of current events at the workplace regarding the police officer and the roommate. While a scene may initially appear to fit one hypothesis careful documentation and analysis of the evidence, along with a little workplace gossip, can turn the investigation toward a different conclusion.

Staged Crime Scene, Police Officer Retaliation, Details

D21 Drowning in Fuel: A Case Report

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After attending this presentation, attendees will learn about drowning in fluids other than water.

This presentation will impact the forensic science community by presenting a case report of a man who drowned in fuel.

Drowning in liquid, other than water is a non-frequent occurrence. From the analysis of *forensic* literature it is deduced, in fact, that a

systematic study doesn't exist on this matter. The drowning in fluid different from the water usually happens in liquid not mixable with the blood as the fused fat, the oil and its by-products or in substances like beer, wine and them by-products, where the alcoholic vapors compete in the reduction of the consciousness, favoring the drowning. The nature of the event is usually accidental although some of these deaths can cause safety problems in the working places.

Personal observations of a drowning case in gasoline is described. Two young people of black race, one male and one female, were found deceased on board of a craft used by clandestine immigrants for the crossing of the Channel of Sicily. The short distance between the southern coast of Sicily and the northern coast of Africa favors the crossing of the Channel of Sicily from precarious and overloaded boats of men that seek their fortune through the clandestine immigration in Europe. During the judicial inspection (conducted by another expert) the corpses were found inside two cans of metallic material. At inspection, the corpse of the female showed all the characteristics of the drowning in water of sea (as then confirmed by autopsy examination). The male corpse had maceration of the skin and strong smell of gasoline.

The autopsy examination, ordered by the Judicial authority, showed the presence of the characteristic signs of the asphyxia (conjunctival petechiae, blood fluidity, blackish-colored blood) and atypical signs of a drowning in water, as the oily surface in the blood, on the pulmonary surface and pulmonary squeezing, as well as the presence of abundant oily material inside the stomach. Such liquid, exposed to the action of a flame, got burned. The withdrawn material, preserved in special containers of plastic material, determined the corrosion of the same subsequently confirming the hypothesis of the drowning in gasoline.

Histological investigations, conducted through the use of colorations of base and colorations contemplated for the specific diagnostic question, confirmed the drowning in gasoline, on the base of the comparison of pulmonary parenchima homogeneously turned necrotic with destruction of the cellular structures, excluding the presence of any other pathology able to autonomously determine the death of the young male.

Despite the indication of drowning in gasoline, there were no signs of battering were found on the victim, which excluded the cause of death being a homicide. It is reasonable to suppose that the death of the youth was accidental, although the judicial investigations have not confirmed the real nature of the event.

Drowning, Fuel, Asphyxia

D22 Use of Proposed Standardized Geophysical and Archaeological Forensic Techniques to Supplement Crime Scene Investigations: Concepts and Examples of Applications

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After attending this presentation, attendees will have an enhanced understanding for standardization of methods used in combined geophysical and archaeological activities in the field of crime scene investigation.

This presentation will impact the forensic science community by comparison of successful and unsuccessful geophysical deployment strategies as well as argue strongly for use of combined interdisciplinary geophysics and archaeology to establish basic methodologies for discovery and recovery of burials.

Here, some of the major issues encountered during the brief history of the North Carolina Program for Forensic Sciences will be discussed.

This presentation will better motivate the forensic science community by providing an understanding of how standardized field techniques used in combined geophysical and archaeological forensic investigations can be beneficial to the success archaeological forensic techniques by improving the chances for successful criminal burial site recognition.

This project reviewed successful and unsuccessful combined geophysical and archaeological crime scene investigations and identified key components that were lacking in unsuccessful programs that were present in successful investigations. After a review of the findings, recommendations are presented for the establishment of standardized field techniques the geophysical and archaeological forensic specialist. The goal of this discussion is to provide additional initiatives that will foster communication within the geophysical/archaeological scientific communities.

Geophysical and archaeological field sampling techniques require the establishment of anticipated results, and a clear identification of physical parameters that need to be collected to satisfy the anticipated results. This includes: identification of target (i.e., weapons made of steel permit a restricted number of geophysical techniques for evaluation), or other parameters, such as potential depth of burial, size of object, and overall site conditions may further restrict the selection of available geophysical sampling solutions. This selection process is part of what we call "mental mobilization" and is key to selecting the appropriate search methodology. These simple principles have been widely adapted by other professionals in non-criminal applications (i.e., location of underground pipe, tanks, and buried waste). Although the crime scene presents a unique set of issues during the investigation, the scientific principles remain the same.

This presentation will provide examples of geophysical/archaeological combined investigations, and how by following the basic principles of an organized search the chances of success have been improved. Simple guides (tables) will be provided for the selection of investigation methodology using the current knowledge base of geophysical/archaeological investigatory techniques including but not limited to:

- Single and multi-frequency electromagnetic detectors (for large to small area surveys where rapid assessment is desired);
- Total and Gradient Magnetometers (for large and small area survey are desired, and potential targets are composed of iron/nickel compounds);
- Ground-penetrating radar for medium to small areas (where soil and ground conditions permit use); and,
- Other methods such as remote sensing using aerial photography, mapping using GPS, and reflectance and thermal infrared imaging will also be considered.

Results of geophysical/archaeological evaluations provide a valuable and constructive feed-back mechanism to facilitate discovery and recovery of human remains and/or associated crime scene evidence. These data may also be used to provide important information for the inclusion and exclusion of potential areas for evaluation.

Geophysics, Archaeology, Standardization

D23 Geographical Spatial Analysis of Homicide Offenders' Residences in Baton Rouge, Louisiana: An Example of How to Use GIS in Forensic Investigations

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After attending this presentation, attendees will gain knowledge of how a GIS (Geographic Information System) can be created to aid in forensic investigations. Also, attendees will learn how GIS can provide investigators with statistical results in map-form. The resulting maps provide insight into how features in the landscape affect human behavior.

This presentation will impact the forensic science community by showing attendees the process of identifying central points and hot spots associated with where homicide offenders once lived in Baton Rouge, Louisiana. From the generated maps identifying the highest concentration of offender residences, researchers and members of law enforcement will gain a necessary understanding for applying Central Crime Theory to homicides occurring outside of Baton Rouge (Chainey & Ratcliffe, 2005).¹ Also, attendees will learn how statistical spatial analysis can be used to determine if offenders' residences are clustered or dispersed.

Homicides involve a minimum of two individuals—the victim and the offender—yet a majority of the geographical discussions on homicides only reference the location where the victim's body was found. Rather than focusing on the geographical areas associated with homicide victims, this presentation focuses on the geographical areas associated with offenders. Often criminals will operate from an anchor point that he or she feels comfortable with. The criminal will leave the anchor point to commit the crime and then return to the anchor point because it is the offender's "safe haven." Often the anchor point is the offender's residence, so comparing the geographic distributions of homicide offenders' residences within a certain area can offer a new approach to learning about the criminal activity within the area as well.

The Baton Rouge Sherriff's Office provided the addresses for the residences of offenders committing homicides in Baton Rouge, Louisiana, between 1991 and 1997. The addresses were geocoded and assigned X and Y geographic coordinates, which resulted in 304 point locations. A GIS was created using these points, and CrimeStat 3.1 and ArcMap 9.3 were used to analyze the geographical distributions of homicide offenders' residences. The results were obtained using various techniques associated with three different types of statistical spatial analysis: Descriptive spatial statistics, nearest neighbor analysis, and spatial cluster analysis.

The results from this research indicate that homicide offenders in Baton Rouge tend to live in one generalized location in the northern point of the city. The spatial analysis from this research also indicates that the presence of major features in the landscape (e.g., Mississippi River, Interstate 10, shopping malls, etcetera) influenced the overall spatial distribution of where homicide offenders reside. Awareness of how features in the landscape can influence human behavior is an important component to any criminal investigation, and the use of GIS can aid in the identification of these influences.

References:

1. Chainey, S. and Ratcliffe, J. 2005. *GIS and Crime Mapping*. Chichester, West Sussex, England: John Wiley & Sons.

GIS, Spatial Analysis, Homicide Offender

D24 Analysis and Classification of .22 Caliber Firing Pin Impressions

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After attending this presentation, attendees will be able to describe the .22 caliber firing pin classification system and its application to forensic investigations. The objectives of this presentation are to explain a .22 caliber firing pin classification system, describe how to examine and compare morphological variations and measurements in cartridges, and to describe how to code and retrieve cartridge cases.

This presentation will impact the forensic science community by providing an innovative firing pin classification system that can be used to associate cartridge cases found at crime scenes to a firearm based on the firing pin morphology.

The classification system is an alternative to storing images with ballistic scanning software. Using this system, examiner's can code, file and retrieve .22 caliber cartridge cases for comparisons. The firing pin impressions from unidentified .22 caliber cartridge cases found at crime scenes can be associated with similar .22 caliber firing pin impressions on file using the classification system.

Twenty-five different types of .22 caliber firearms, ten rifles and fifteen handguns were test fired to collect a variety of firing pin impressions for analysis. The fifteen handguns included seven pistols and eight revolvers. The pistols tested included: Beretta Model 21A-22LR, Cobra Derringer, Davis Derringer, Ruger Mark II, Sig Sauer Mosquito, Thompson Center, and a Walter P22. The revolvers included: FIE Model 15, FIE Model TEX 22, Harrington & Richardson Model 922, High Standard, Iver Johnson, RG-10, RG-24, and Smith & Wesson Model 617. The rifles included seven semi-automatics and three single shot bolt actions. The semi-automatics included: Browning, Marlin Model 60, Marlin Model 75, Ruger 10/22, Savage Model 64G, Winchester Model 190, and Winchester Model 290. The single shot rifles included: Mossberg Model 26B, Remington Model 510, and Remington Model 547. All firearms used in this study were pre-owned and obtained from gun shops for test firing.

The bullet and propellant were removed from the cartridges and the priming mixture was neutralized before collecting the firing pin impressions. The priming mixture was soaked in isopropyl alcohol for 12 hours followed by another 12 hours in water and dried at 20°C (68°F). This process neutralized the priming mixture and prevented detonation while test firing to obtain an impression. A stereoscopic boom microscope equipped with a digital camera and measuring software was used to record the measurements of each cartridge impression.

The firing pin impressions were divided into groups based on geometric shapes and measurements. Group I firing pin impressions were square to rectangular in shape, Group II impressions were circular or semi-circular, and Group III impressions were angular or wedge shaped.

Group I impressions were first separated into small (S), medium (M), and large (L) based on the amount of surface area made by the firing impression. The (S) range for surface area was 0.60 – 0.89 mm², (M) 0.90 – 1.79 mm² and (L) 1.80 – 2.00 + mm². Next, they were separated into (S), (M), and (L) based on the width of the firing pin impression. The width range for (S) was 400-599 μm, (M) 600 – 799 μm, and (L) was 800 – 899 + μm. Finally, they were separated into (S), (M), and (L) based on the height of the firing pin impression. The height range for (S) was 800 – 1199 μm, (M) 1200 – 1599 + μm. Using these measurement ranges, the firing pin impressions could be classified into one of 27 divisions. In the firing pin classification system developed, the first letter in the three-letter arrangement represents the amount of surface area made by the firing pin impression, the second letter represents the width of the firing pin impression and the third letter represents the height of the firing pin impression. The classification

system was ordered as follows: SSS, SSM, SSL, SMS, SMM, SML, SLS, SLM, SLL, MSS, MSM, MSL, MMS, MMM, MML, MLS, MLM, MLL, LSS, LSM, LSL, LMS, LMM, LML, LLS, LLM, or LLL.

There was only one category for Group II impressions and that category was based on the radius of the firing pin impression. It was divided into (S), (M) and (L) divisions based on the radius of the firing pin impression. The (S) range for the radius was 200- 499 μm , (M) 500 – 599 μm , and (L) 600 - 699 + μm . There were no wedge shaped firing pins in the firearms sampled; however, they would be separated by surface area using the same range as used for Group I impressions.

When Group I firing pin impressions were classified based on the square surface area of the impression, 28% were (S). Within this (S) group, 6% were classified as SSM, 6% SSL and 6% SLS based on the firing pin impression height and width respectively. Seventeen percent of the impressions were (M) and within this group 11% were MMM. Only 1% of the firing pin impressions were in the (L) group.

Consequently, using this classification system, 20 out of 25 firearms could be eliminated in the SSM classification, 24 could be eliminated in the SSL, 24 eliminated in the SSM, and 24 in the SLS classification. For firing pin impressions with “M,” out of the 25 impressions, 23 could be eliminated in MMM, 22 in MML, 22 in MLM and 24 in LLL.

In conclusion, this system associates firing pin impressions from .22 caliber cartridge cases found at crime scenes to similar .22 caliber firing pin impressions filed in this classification system. As a result, cartridge cases can be examined to determine association to a firearm based on the firing pin morphology.

Firing Pin Impression, Cartridge Case, Firearm

D25 The Effects of Gunshot Trauma on the Rate of Colonization by Flesh Eating Insects Using Pig Carcasses

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After attending this presentation, attendees will have a better understanding of the effects that gunshot trauma have on the insect's role in the decomposition of swine carcasses.

This presentation will impact the forensic science community by helping to overcome the obstacle of PMI being compromised when gunshot trauma is involved and allow forensic entomologists more accurate assessments.

It was hypothesized that swine carcasses inflicted with gunshot trauma would significantly vary from carcasses with no gunshot trauma. There has been little research done on gunshot trauma and the effect it has on decomposition. The focus of this project is how gunshot wounds effect blow fly colonization. When gunshot wounds lead to death, the arrival of insect fauna is inevitable. There were different weapons used in this project as follows: 12ga. shotgun loaded with 2.75” shell containing 7.5” bird shot; .40 caliber pistol using 150 grain hard ball ammunition; 9MM parabellum pistol firing hard ball ammunition; and .22 caliber LR pistol firing hard ball ammunition. Throughout the course of this project 100 pig carcasses were used. Three research runs were conducted; summer 2009, fall 2009, and spring 2010. Each of the four calibers had five replicates as well as five controls for a total of 25 pigs per research trial run. The location of the research area was an enclosed compound measuring 50’X50’X5’ high. The area also had a concrete footer that kept scavengers out as well as a random pulsating electrified fence along the top to keep scavengers out. Locations of pig carcasses were randomly assigned using a random number generator. The carcasses were monitored and photographed twice daily and notes were taken to document blow fly activity and beetle activity. Wound

diameter was measured daily to track wound decomposition. The major stages of blow fly activity were noted: adult flies, fly eggs, fly larvae, migrating fly larvae. The presence of beetles and the end of maggot migration (characterized by the absence of observable larvae on the body) was also noted. This can allow researchers to document differences in development time as well as the initial onset of blow fly life stages. Blow fly adults and larvae were collected in accordance to the standard operating procedures outlined in Haskell and Williams (2008). This was done each day to document any differences in species composition or development among the different treatments. Adult flies were collected and preserved in 70% EtOH and collected fly larvae were killed in KAA (composed of 95% ethanol (77%), acetic acid (15%) and kerosene (8%)) and transferred to 70% EtOH for preservation.

Forensic entomologists are often asked by law enforcement agencies to provide an estimation of the PMI using insects. If wounds such as gunshot trauma are present and this has an effect on the blow fly activity, then the estimation of the PMI is therefore compromised. The data obtained from this research will impact the forensic science community by helping to overcome this obstacle when gunshot trauma is involved and allow forensic entomologists more accurate assessments.

Forensic Entomology, PMI, Gunshot Trauma

D26 Application of Micro Digital Measurement in Fingerprint and Firearm Comparisons: A New Method for a Reliable and Valid Approach

John Z. Wang, PhD, California State University-Long Beach, 1250 Bellflower Boulevard, Long Beach, CA 90860*

After attending this presentation, attendees will receive sufficient information of the micro digital measurement, the new device, the operating steps, and the unique features of the new technology, as well as, observe a live examination by the presenter.

This presentation will impact the forensic science community by introducing a new technique for fingerprint and firearm examinations: micro digital measurement using a palm-sized digital viewer. The device and the technique will impact the forensic science community by providing statistical and geometrical measurements of the evidence compared, and thus increasing greatly the levels of reliability and validity.

Current fingerprint (Integrated Automated Fingerprint Identification System – IAFIS) and firearm (National Integrated Ballistic Information Network – NIBIN) database systems are able to use digital technology for a comparison via a probability analysis. Yet to a large extent the two systems are solely based on the pattern and minutia characteristics between the known and the unknown samples without any statistical and geometrical measurements. Therefore, an examiner often has to rely heavily on his or her experience to make a decision and faces routine accusations of using “subjective factors” from the defense in court. This is exactly the focal point in the recent debate and accusation of fingerprint and firearm examination as non-science disciplines from the influential report which was issued in February of 2009.

To address the issue of lacking digital statistics and geometry that other advanced forensic examinations are using, the two fingerprint images will be used from the Madrid bombing case and illustrate the advantages of this new device. First, the equipment is a palm-sized device and can be connected to a laptop via a USB, thus being portable for a crime scene examination. Second, the device takes digital pictures of fingerprints and bullets/casings for comparisons, which makes it easier for online communications and evidence storage. Next, the device can be connected with a projector for a live comparison and analysis at any locations, such as the police department, the district

attorney's office or in court during an expert testimony. Further, the device has multiple light sources with black/white, UV, infrared, and polarized lights, each with a magnification range from 1 to 250x. Most importantly, the new technique can provide micro digital measurements, which is a very practical comparison technique for fingerprint and firearms examinations. The measurement unit can be set at inch, mil (0.001 inch), um, or mm. the micro digital measurement is able to calibrate nine types of digital statistical and geometrical measurements simultaneously. The nine formats are: (1) line; (2) continuous line; (3) polygon; (4) radius circle; (5) diameter circle; (6) three points circle; (7) three points arch; (8) three points angle; and, (9) four points angel. With the nine formats, the author is trying to explore comparisons on partial fingerprints and heavily distorted bullets/casings.

With the three unique features of being portable, digital, and practical, this new device should be considered as a great tool in teaching forensic science in classrooms, conducting a preliminary examination at the scene, or even performing a supplemental or even verification examination in the lab. Finally, this pale-size device can provide an effective live demonstration in court with straightforward statistical and geometric digital images (measurements) of the evidence between the known and the unknown samples to the jury that no other device can display a similar function.

The forensic science community now has come to a crossroad that both qualitative and quantitative measurements are critical in courtroom battles. It is suggested that this new technique may provide a new direction for the fingerprint and the firearms examinations and promote them to be more reliable and valid disciplines.

Micro Digital Measurement, Fingerprints, Firearms

D27 Observed Microscopic Changes of Bullets Fired From Barrels After Cleaning With Bore Brushes

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After attending this presentation, attendees will gain an appreciation for the effect that metal bore brushes commonly marketed and sold in retail firearm stores for cleaning have on the striations in a bullet's land impression and the need for care when analyzing firearms that are subject to frequent cleaning.

This presentation will impact the forensics science community by demonstrating the susceptibility of changing land impressions that are frequently cleaned with bronze or steel bore brushes over the long term. It will also encourage firearms examiners to be cautious when comparing firearms likely to have been cleaned after a shooting incident, either through an extended lapse of time or through recovery of such cleaning brushes along with evidence firearms.

Although it is considered common knowledge that using steel bore brushes to clean firearm barrels may have potential to change the pattern individual characteristics, no documentation of the effect is to be found in the literature. In an effort to confirm this effect, several 9mm semiautomatic pistols were field-stripped and their barrels subjected to a simulation of long-term use of various bore brushes. Using Hoppe's No. 9 Solvent as a cleaning solution, bore cleaning brushes of various compositions (nylon, bronze, or steel) were passed through the barrels 1,000 times using a standard cleaning technique. Test groups of three bullets each were fired before cleaning began and at varying intervals during the process, and the bullets of each test group were compared to each other and earlier test groups.

The results demonstrate that metal bore brushes have an ability to affect the land impressions. In most instances this appears to be through erosion, as fine striations were broadened and lowered by smoothing or obliterated entirely. Coarse marks were less likely to be affected. While steel brushes were most effective, the effect was also observed after cleaning with bronze brushes.

While all final test fires could still be matched to the initial test fires, fewer areas of good correspondence were observed, and often an easy match became a difficult one with only one or two lands having sufficient striations remaining. In addition, the effect appeared somewhat random, with unequal results on particular land impressions within the same barrel. It is conceivable that with some firearms, this change in the individual characteristics could render the entire bullet unmatchable to an earlier-fired bullet.

Firearms, Land Impressions, Bore Brushes

D28 The Use of Infrared Imaging to Facilitate Fired Cartridge Case and Bullet Comparisons

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After attending this presentation, the attendees will have an overview of different image acquisition techniques for cartridge cases and bullets. A near-infrared (IR) camera connected to a stereomicroscope that is capable of acquiring IR images of fired evidence will be demonstrated in this presentation.

This presentation will impact the forensic science community by exploring the microscopic capabilities of IR research as applied to the comparison of fired bullets and cartridge cases. IR has been extensively used for night-vision, search-and-rescue operations, navigation, astronomy, and medical body scans. Current forensic use of near-IR involves detecting gunshot residue and biological stains. This research explores the microscopic capabilities of near-IR research as applied to the comparison of fired bullets and cartridge cases. Advanced machine learning technology can also be easily implemented with the IR images. Time saved will enable examiners to reduce backlog by efficiently and effectively comparing firearms related evidence.

Lighting is a common problem faced by firearms examiners when comparing cartridge cases and bullets. Visible light interacts with the surface texture of these items resulting in the production of shadows. These shadows are key for comparing and identifying striations and impressions on evidence fired from the same firearm. However, if the lighting is not exactly the same for the two items being compared, differences in the shadows may be created, which could make an evaluation of the items more difficult. Other problems related to the use of visible light for cartridge case and bullet imaging include reflected light issues, glare, and the incident angle of oblique lighting. Image acquisition techniques such as 2D and 3D laser imaging, scanning electron microscopy, and thermal infrared microscopy will be reviewed and compared.

In this work, a digital SLR camera with IR capabilities will be fitted with an IR filter, mounted to a stereomicroscope, and used to capture images of cartridge cases and bullets. Different light sources will be compared for use with the camera. Test fired cartridge cases and bullets from multiple makes and models of firearms will be photographed using both near-IR and visible light. Both faint and exaggerated striations and impressions will be photographed in order to determine the sensitivity of using near-IR for imaging this type of evidence.

The difference between this work and other related research is that near-IR imaging will be used to facilitate manual comparison of firearms-related evidence by examiners. IR images produced by near-IR light are expected to reveal more detail than visible light microscopy, resulting in a detailed image that is suitable to assist forensic firearms examiners in their evaluation of fired cartridge cases and bullets. It will be shown that the connection of a near-IR camera and a stereomicroscope is an affordable, efficient, and useful adjunct to visible light microscopy for crime labs.

This research will evaluate the use of near-IR light to examine fired bullets and cartridge cases using a comparison microscope. Forensic firearms examiners will compare bullet and cartridge case images captured with near-IR light and visible light. The benefit of using near-IR light will be determined. It is anticipated that this new way of microscopic image acquisition will facilitate forensic firearms examinations.

Infrared, Firearms, Identification

D29 Features of Gunshot Wounds to the Head on Postmortem Computed Tomography

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After attending this presentation, attendees will be able to identify the characteristic features of gunshot wounds to the head, as seen on Postmortem Computed Tomography (PMCT).

This presentation will impact the forensic science community by providing pictorial information of characteristic features of fatal gunshot injuries to the head on PMCT. With the increasing use of postmortem imaging methods, forensic pathologists should be aware of special imaging characteristics of gunshot wounds to the head, such as entry and exit wounds, projectile paths and projectile localization. After the presentation, the audience will improve knowledge on typical patterns of bullet wounds to the head and learn about the limitations and advantages of PMCT concerning this topic.

Purpose: Fatal head injuries due to gunshots can be either penetrating or perforating and projectiles may or may not be found inside the cranial cavity. Describing the exact path of the projectile, beveling, and resulting injuries, as well as determining the entry and exit wounds, are of great importance in forensics. There are special macroscopic characteristics, which a forensic pathologist uses to distinguish between entry and exit wounds during autopsy. Reconstruction of events is feasible based on these findings. The goal of the present retrospective case study was to determine if PMCT examination in cases of gunshot fatalities to the head could answer relevant forensic queries. Similar studies in the past, with fewer cases, have already stated the importance of PMCT when investigating such fatalities.

Material and Methods: The Forensic Institute database was retrospectively evaluated for lethal gunshot wounds to the head. In a five-year period (March 2005 to March 2010) 46 cases were identified. The postmortem interval (time interval between death and the CT imaging), the manner of death (suicide, homicide, accident) as well as the age and sex distribution of the fatalities were evaluated. Axial, sagittal and coronal multiplanar reformations, as well as volume rendered models, were constructed. Primary image review and 3D reconstructions were carried out on a CT workstation and on the local picture archiving and communication system (PACS).

Results: Image findings were analyzed for projectile-type, penetrating or perforating injuries and specific location of entry wound. Typical imaging characteristics for each group were determined. The presence of gas, metal parts, projectiles, or osseous fragments in the cranial cavity as well as parenchymal brain injuries and intracranial hemorrhages were evaluated.

Discussion: PMCT is a reliable technique to depict fatal gunshot injuries to the head. Identification of beveling, reconstructions of a bullet path and identification of gunshot entry or exit wounds are feasible. Moreover, PMCT as a cross-sectional imaging modality allows for precise anatomic localization of bullets in penetrating trauma, clearly superior to two-dimensional plain radiography. Identification of millimeter-sized foreign objects (e.g. metal or osseous fragments) is feasible on PMCT whereas such findings might be missed during manual dissection or not even be dissected (e.g. face, cranio-cervical junction, vertebral column). Image reconstructions of PMCT are easy understandable for lay-people and at court, besides the advantage of permanent documentation and the possibility of re-evaluation. Findings are displayed in a time saving manner without any obligatory destruction during classical autopsy. Limitations of PMCT imaging, such as depiction of soot residues, skin patterns and vascular lesions are discussed. Besides external inspection, these limitations can (partially) be overcome by complementary surface scanning, photogrammetry and PMCT-angiography/magnetic resonance imaging.

Conclusions: PMCT is an excellent tool for displaying perforating and penetrating gunshot wounds to the head and allows for reconstruction of events. In order to improve quality in the field of forensic pathology, PMCT should be applied in routine investigation of legal cases, especially in cases with fatal gunshot wounds to the head.

Virtopsy, Gunshot Wound, Postmortem CT

D30 Heating Up "Cold Cases": Research and Service for Unsolved Cases of Human Identification

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After attending this presentation, attendees will be presented with examples of cold cases undergoing reinvestigation utilizing methods that were not readily available during the initial investigation. The objective of this presentation is to establish a systematic and comprehensive set of methods applicable to unsolved cases involving unidentified human remains, as well as, to present a comprehensive model that includes the latest tools and technologies for investigating unsolved cases of human identification. Attendees will be presented with examples of field, laboratory, and morgue methods for ongoing investigations.

This presentation will impact the forensic science community by providing an example of a collaborative, multidisciplinary approach to research and casework involving unidentified human remains, and by also providing examples of collaborative, multidisciplinary research and casework involving unidentified human remains. Specifically a protocol is presented for cold case investigations with particular attention to the challenges that may arise when new methods are presented in court.

Over the past year, a service oriented research initiative among the Forensic Anthropology Laboratory at the University of South Florida and the Hillsborough, Pinellas, Pasco, and Hernando County Medical Examiner's Offices in Florida was undertaken in collaboration with local law enforcement agencies throughout the Tampa Bay region to apply a

range of methods to unsolved cases dating back to 1969. The goals for this project were to: (1) assist local medical examiners with unsolved identification issues; (2) systematically apply a comprehensive set of methods to all unsolved cases in the region; and, (3) document osteological, chemical, burial and postmortem factors about each case to develop a baseline of data relevant to the local population and natural environment in the area. Through the course of this project, a wide variety of field, morgue, and laboratory methods were applied and the preliminary findings are discussed in this presentation.

In addition to analyzing unidentified skeletal remains retained by the medical examiner's offices, this project exhumed graves of unknown individuals buried in numerous cemeteries as "John" or "Jane Does." Ground penetrating radar was used to accurately document each exhumation case and to establish the parameters for grave excavation. A full osteological analysis was completed for each case to re-evaluate the initial parameters of identity, such as age, sex and ancestry. Some of the earliest cases had not previously been analyzed by an anthropologist. Two programs were used to evaluate the biological parameters for each individual. Additionally, bone and tooth samples for DNA and chemical isotope analysis for each case was completed. In cases where an original sketch or photograph from the autopsy was not available, 2D facial composites were created. To date, more than 35 cases have been included in this project.

Previously published research on unidentified remains in Florida showed that many individuals come from immigrant, migrant, or at-risk groups. In this investigation, several trends emerge among males and females in terms of the demographic profile, the type of original burial site, cause and manner of death, and the rates of decomposition given the burial context. Initial analysis shows that males ($n=13$) and females ($n=13$) representing African-American ($n=7$), European-American ($n=5$), Mesoamerican ($n=4$), South American ($n=6$), and Circumcaribbean ($n=1$) ancestry. Currently, craniometric analyses indicate there are more African-American and South American individuals found in the Tampa Bay region with distinct trends among males and females.

The methods and results of this project are presented here. Additionally, legal issues that have challenged anthropological methods in court in these districts are outlined. The ways in which regionally specific data and case studies can offer demonstrative examples in court are addressed. Finally, this project resulted in new course development at the University of South Florida for graduate students in Anthropology. The new course is a service learning course in which students work with community partners throughout the medicolegal community on the problems of missing and unidentified persons. The ability of anthropologists to use their research and casework for education is also critical for practitioners who work in university settings. This project reflects forensic anthropology today and the changing role of anthropologists in death investigations.

Identification, Cold Cases, 3D-ID

D31 Autoerotic Deaths: A 25-Year Retrospective Epidemiological Study

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After attending this presentation, attendees will have a better understanding of the epidemiology of autoerotic deaths.

This presentation will impact the forensic science community by providing new insight into the incidence of autoerotic deaths.

Introduction: Autoerotic deaths have been defined as accidental deaths occurring during individual, usually solitary, sexual activity in which a device, apparatus, or prop employed to enhance the sexual stimulation of the deceased in some way caused unintentional death. It

is written in almost all papers on autoerotic deaths that autoerotic fatalities account for about 500 to 1,000 deaths per year in the United States. This highly cited number is now of general acceptance, and was generalized to estimate the number of cases in Canada as well. However, a closer look at the original reference reveals that contrary to the general belief, this incidence does not originate from an epidemiological study in United States, but from an estimation from unpublished data available from England and Canada. However, a Canadian study challenged this number in 2008 and demonstrated that the incidence was significantly lower in the province of Quebec. Presented here is a 25-year epidemiological study of autoerotic deaths in the province of Alberta, Canada.

Material and Methods: The Province of Alberta (Canada) is divided in two Offices of the Chief Medical Examiner, one in Edmonton and one in Calgary. The database of both offices was searched for the following keywords: sexual, autoerotic, sex, naked, penis, semen, breast, vagina, porn, pornography. These keywords were not only searched for in the cause of death but in all other parts of the file as well (for example, in the investigators summary and investigators notes). All non-suicidal hanging and asphyxial deaths were also reviewed.

Results: From 1985 to 2009, 38 cases of autoerotic deaths were found (incidence of 0.56 per million inhabitants per year). The number of cases per year varied from none to four (average 1.52 ± 1.08). Victims were all males, aged from 16 to 74 years (average 33 ± 12). Most victims were single. The vast majority of deaths were related to typical methods (36 cases, 95%). The most common method was hanging (28 cases, 74%). Atypical methods were encountered in 5% of cases: one case of electrocution combined with hanging, and one case of atypical asphyxia method by inverted suspension. The most common location the bodies were found was basement (34%), followed by bedroom (24%), and bathroom (13%). The majority of victims were not under the influence of ethanol or drugs when the accidental death occurred. In 23% of the victims, an acute ethanol intoxication above 80 mg/100 ml was found. Cannabis, methamphetamine, or cocaine was found in 13% of the victims. In 23 cases, the investigation established if the event occurred in the morning, afternoon, evening, or night. There was no clear evidence of a preferential time of day for these deaths. However, it seems that autoerotic deaths might be slightly more common during summer (37%). The geographic distribution of autoerotic deaths reveals a preferential distribution in big cities compared to rural areas: the incidence in Calgary was 0.76 per million inhabitants per year, compared to 0.57 in Edmonton, and only 0.44 in the rest of Alberta.

Discussion: The widely cited incidence of 500 to 1,000 autoerotic deaths per year in the United States is based on data from 1983. Considering that the population of United States in 1983 was of 226.5 millions, this incidence corresponds to 2.2 to 4.4 cases per million inhabitants per year. In 2010, the population of United States has increased to 309 million. Therefore, the incidence of 500 to 1,000 autoerotic deaths per year in the United States should be changed to 700 to 1,400 deaths per year considering the population increase. However, these numbers are largely overestimating the reality in Canada, and are probably overestimating the reality in United States as well. Epidemiological studies are needed to re-assess this estimate in United States. Further studies are needed to better assess the incidence of autoerotic deaths in different geographical and socio-economical areas.

Autoerotic Death, Autoerotic Asphyxia, Incidence

D32 Death Investigations in Rural Meigs County, Ohio Under the Coroner's Inquest System

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After attending this presentation, attendees will understand the coroner investigation system in Ohio, the challenges faced by rural counties investigating deaths, and how regional forensic systems in Ohio, such as the Montgomery County Coroner's Office, assists with rural county investigations.

The presentation will impact the forensic science community by providing a view that a coroner system need not be arcane and antiquated; rather, if properly regulated by state law, the coroner investigation system such as exists in Ohio can be as effective a tool for death investigations as the medical examiner system.

Ohio is a coroner state. Each of the 88 counties elects a physician who serves for four years in that capacity. Ohio law requires the coroner to be a licensed physician who has been in practice a minimum of two years and is mandated 16 hours of professional development per year. Larger cities such as Columbus, Cincinnati, Cleveland, and Dayton have forensic centers that serve as forensic resource centers for counties that do not have the fiscal resources to support such centers.

Meigs County, Ohio, with a population of about 23,500 persons is situated in the Appalachian plateau region of southeast Ohio. The county is economically challenged with a systemic unemployment rate of over 15%. Medicolegal investigation in this fiscal environment is a challenge. The current annual budget for the coroner's office is \$29,096.00. The office employs an elected coroner, the incumbent of which is a family practice medical doctor and has been the coroner since 1988, as well as an investigator who is also the County Health Commissioner. The office receives an average of 50 cases calls per year of which about 24 are sent to the Montgomery County Coroner's office for autopsy. The cost for an autopsy, including transportation of remains, is about \$1,800.00. These costs are paid out of the County General Fund and are not part of the coroner's budget. The budgets of the sheriff's office and local police jurisdictions for investigations as well as training are likewise restricted and as a result, the Ohio Bureau of Criminal Identification is often called upon to assist in death investigations.

Because of fiscal constraints, not all cases reported to the coroner's office are scene investigated beyond the telephone call. Natural manners involving, hospice, nursing homes, and cases with a documented medical history, especially the elderly, do not normally receive a response. Sudden and unexpected death involving adults and children are investigated but not all are sent for autopsy depending on investigative circumstances. Homicides and undetermined are autopsied. Most suicides not involving the elderly with a medical history and most accidental deaths are sent for autopsy.

It is believed that the Ohio coroner's system serves medicolegal purposes satisfactorily. Cases are investigated on a case by case basis with resources directed to those cases that most impact the public safety and health of the community.

Coroner, Medical Examiner, Death Investigations

D33 The Society of Medicolegal Death Investigators is Now Operational

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After attending this presentation, attendees will be informed of the Society of Medicolegal Death Investigators, a newly created educational organization to promote medicolegal death investigators and their profession.

This presentation will impact the forensic science community by introducing attendees to The Society of Medicolegal Death Investigators (SOMDI), the newly created professional organization for medicolegal death investigators.

Medicolegal death investigators are employees of medical examiner or coroner offices who investigate violent, suspicious, sudden and unexpected deaths. Following office standard office procedures, they are the first line of defense of the jurisdiction's death investigation system. Their decisions at the time of the initial death report can mean the difference between a homicide being overlooked or recognized or a dead person never being identified, misidentified or scientifically identified.

Lay investigators began working for medical examiner systems in the mid-1960s. In the early 1990s, a group of veteran, experienced death investigators from throughout the United States collaborated and developed a set of voluntary guidelines for their profession. The National Institutes of Justice then published these in December 1997. The term "medicolegal death investigator" was selected to differentiate these individual investigating deaths for coroner and medical examiner offices from investigators working for law enforcement agencies.

Since 1998, the American Board of Medicolegal Death Investigators (ABMDI) has been professionally certifying medicolegal death investigators. As of July 31, 2010 there are more than 1,550 medicolegal death investigators certified in North America and four foreign countries. It is estimated that there are more than 8,000 medicolegal death investigators working in North America.

In February 2009, the National Academy of Sciences released their report, *Strengthening Forensic Science in the United States: A Path Forward*. The report noted that the forensic science community is plagued by poorly funded systems and inconsistent practices in federal, state and local crime laboratories and medicolegal offices. The Report emphasized the future needs of forensic science practitioners to include:

- mandatory professional certification for all practitioners;
- development of discipline-specific practice standards; and,
- high-quality education, training and continuing education opportunities should be available to all those working in the forensic sciences

The United States has two types of medicolegal death investigation systems: the coroner and medical examiner systems. The coroner is an elected official that is responsible for death investigations and administrative duties of his/her office. A medical examiner is often an appointed official who is an ABP board-certified forensic pathologist who oversees the entire death investigation process, handles administrative duties and performs autopsies for his/her office. Both groups currently have their own professional organizations that representing them – the International Association of Coroners and Medical Examiners (IACME) and the National Association of Medical Examiners (NAME). Medicolegal death investigators may join both organizations but they are not the primary focus of either organization.

That is why The Society of Medicolegal Death Investigators has been created – to represent the medicolegal death investigator profession, its needs, and concerns.

The Society of Medicolegal Death Investigators (SOMDI) will be operational January 1, 2011. This will be a voluntary professional

membership organization specifically dedicated to medicolegal death investigators and the work they do investigating deaths for medicolegal offices. It will be an organization inclusive of all individuals currently employed as medicolegal death investigators in either medical examiner offices, coroner offices, equivalent military authority offices whose responsibility includes conducting death scene investigations and ABMDI certified individuals.

Organizational details will be presented including membership criteria, application information, organizational structure, contact and website information, training and educational opportunities, and annual meeting details, etc.

Society of Medicolegal Death Investigators, SOMDI, Medicolegal Death Investigators

D34 Caffeine Related Deaths in Young Adults

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After attending this presentation, attendees will understand the possible detrimental effects of periodic fluctuations of blood pressure, caused by the intake of caffeinated drinks, substances containing caffeine, or caffeine supplements, can have on the heart, potentially leading to death.

This presentation will impact the forensic science community by provoking thoughts and questions as to the relationship between death and the intake of caffeine, regardless of the presence of postmortem toxic levels. It will also discuss caffeine's effects on otherwise minor, undiagnosed conditions, in young adults.

This presentation will address the levels of caffeine found in coffee, tea, caffeine drinks, caffeine supplements, and some over-the-counter medications containing caffeine. These levels will then help the audience understand the effects caffeine has on the normal physiology; specifically caffeine's effect on the cardiovascular system and blood pressure.

The different cultural and psychological influences in which caffeine is incorporated into the lives of young adults will also be discussed. For instance, some manufacturers of caffeine products use cars, sporting events, athletes and music events to promote their product. Some exploit the alcohol use of young adults by combining their caffeine drinks with alcoholic beverages. Others align their products with the images of nature and the environment.

The motivation to consume products containing caffeine and the timing of consumption will also be addressed. Some caffeinated products promote their use prior to physical activity. This is believed to improve physical endurance or athletic ability. For examples, some of these products specifically target the drinks to those who participate in extreme sports; resulting in the combination of high levels of stress to the body and high levels of caffeine. Others market their products to maintain mental sharpness. For example, some of these products specifically target the drinks to 'gamers'; resulting in the combination of no physical stress to the body and high levels of caffeine.

Young adults may not be aware their diagnosed or yet to be diagnosed medical conditions may be exacerbated by the intake of caffeine. Others willingly accept the potential complications or deny the personal applicability. Diabetes mellitus, stomach ulcers, kidney disease and seizures are conditions that may be exacerbated by the ingestion of caffeine.

The amount of caffeine in the body at the time of death may be at non-toxic levels but the periodic use of substances containing high levels of caffeine may harm the cardiovascular system or other organ systems. Deaths potentially attributable to caffeine may be similar to deaths

involving alcohol. Deaths from the effects of long-term alcohol use are seen frequently but an overdose of alcohol is less frequent.

Education of young adults as to the effects the caffeinated products is imperative, especially when taking into account the increased numbers of caffeinated products being marketed and the decrease of physical activity and fitness in youth.

Four case studies will be presented, of the deaths of young adults who were known to have ingested caffeinated drinks, substances containing caffeine or caffeine supplements for a period of time prior to death.

Caffeine, Death, Heart

D35 The Killer Economy

Bethany L. Bless, MS, Harris County Medical Examiner's Office, 1885 Old Spanish Trail, Houston, TX 77054*

After attending this presentation, attendees will understand the relationship between the economic downfall and the suicide rate as it pertains to Harris County, Texas. Attendees will also have an increased awareness of the underlying stressors that result in an individual being vulnerable to suicide. Analysis of statistics in Harris County, Texas will be completed during the years 2006-2009.

This presentation will impact the forensic science community by serving as an educational tool for the impact of the poor economy as a possible risk factor for suicide. A full understanding of the risks and factors involved in suicide will help elucidate the interaction between economic cycles, unemployment, and suicide. Improved understanding may help organizations provide services to at risk individuals, possibly preventing some of these deaths in the future.

Recent economic turmoil, increased unemployment and record foreclosure rates have spurred inquiries about whether these changes have led to an increase in suicides. The suicide rates in Harris County, Texas for the period of years 2006-2009 were used to test the general hypothesis that the suicide rate is affected by economic variables and, in particular, to explore the relationship between the economy and the suicide rate. This review shows that a possible relationship exists between unemployment, the economy, and suicide. Although it is difficult to determine the exact stressors that were involved with an individual who commits suicide, a suicide note or comments made to friends or family will give clues into what stressors were involved. This study used investigator reports for Harris County, Texas, and suicide notes left on scene to determine the stressors involved. These statistics were compiled and showed a steady increase in the number of suicides and the number of suicides where the economic downfall, unemployment, or financial strain was specifically mentioned as a primary stress leading to the individuals decision to commit suicide. Statistics showed a steady increase over the years of 2006-2009 in the number of suicides involving financial stress as a factor. The year 2006 was used as a comparison basis for this study as the economic crisis was noted to begin in 2007. There were 363 suicides in 2006, 27 of which revealed suicide notes or comments from family that suggested some financial stress. This is equal to 7.4% of overall cases for the year. In 2007, the number of suicides where notes or family comments confirmed economic stress, increased to 47 cases of the total number of suicides numbering 436 or 10.8%. The trend continued through the 2008 year with 55 of 459 cases or 12.0%. The peak of suicides has been in the year 2009 with 76 of 488 cases or 15.6% of the suicides being directly related to the failing economy. Not all reports contained information valuable in ascertaining whether the economy was a stressor involved. In addition, not all cases involved a suicide note, therefore; many cases where the economy may have been a stressor were unable to be applied with these statistics.

A common “chain of adversity” can begin with job loss and move toward depression through financial strain and loss of personal control. With a better understanding of the risks of suicide, leaders and their organizations can take steps to lessen the impact of the economic downturn. Organizations in the public and private sectors should help make key services more accessible, especially high-quality, comprehensive transition services for the unemployed and assistance for homeowners threatened by foreclosure. Individuals in distress can take action to reduce their own levels of distress. Individuals can engage in activities that relieve anxiety and emotional distress and focus on managing areas in their lives where they still have some control.

Suicides, Economy, Unemployment

D36 Managerial Responsibilities in the Homicide Investigation Process: Making a Case for Periodic Reviews of All Ongoing Death Investigations

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After attending this presentation, attendees will learn about the frequency of homicides in the United States and the clearance rates associated with them; will learn about some of the reasons wrongful convictions have occurred; will learn about other investigative failures that have occurred; and, will be provided with a sample of managerial tasks, that if properly instituted could increase solvability (clearance) rates for homicides.

This presentation will impact the forensic science community by detailing investigative failures in death cases that have contributed to their “cold case” status of being unresolved and will impact the community by outlining a proposal of instituting certain managerial tasks into the investigative framework to increase the number of solved cases.

Over the past five decades the clearance rate of homicides in the United States has dropped from 92% to 62%. In 1993 the highest number of homicides occurred with 24,530 murders that carried with it a clearance rate of 67%. During the next 15-18 years the number of murders dropped to 16,000 while the clearance rate remained in the low sixty percentile.

With the emergence of DNA the innocence projects found a significant number of people wrongfully convicted and contributed those convictions to incorrect identifications of suspects, false confessions, faulty forensic science and scientists, and jail hHouse snitches or informants. With the exception of faulty forensic science and scientists, the majority of reasons cited for wrongful convictions are directly related to the investigative process.

Furthermore, over the years, during the evaluation of numerous cold cases of unresolved homicides it became evident there are a significant number of investigative failures found within these case files that probably contributed to the fact these investigations are still unresolved. A common thread found throughout these evaluations was that there were no supervisors conducting periodic reviews of these investigations to ensure the detectives remained on track.

Detectives, as a whole, are given complete freedom and latitude to conduct their investigations as they see fit. While most of the time this is probably alright, tunnel vision, for example, has a way of surfacing and the investigation goes awry, wasting time and money. However, the inserting of a periodic review process of these cases by a supervisor would serve to identify problem areas and issues early on in the investigation hopefully preventing the investigation from becoming an unresolved cold case.

With this concept in mind two models of a review process will be addressed. One is subjective while the other is objective in nature. The

subjective review process is basically where the supervisor/reviewer conducts regularly scheduled reviews and in most situations uses his/her experience and knowledge to identify and address problem areas. It is subjective in the sense that this process always opens the door to bias and prejudices from the reviewer who is limited to his/her level of expertise. And, in the experience of the author, the criticism from these reviews sometimes becomes more negative than positive that can create an unhealthy atmosphere and even resentment within the investigative unit.

The second approach is objective and comes to us from a police detective in Great Britain who was attempting to address a way to curb the wrongful convictions. He subsequently designed a “structured and guided approach” to conducting a review of ongoing murder investigations “as opposed to the reviewing officer using their own knowledge, experience and skill,” as previously described. The objective review tool he designed, while considered to be somewhat labor intensive, has 31 categories that comprehensively cover the aspects of any murder investigation. As these categories are outlined, one will clearly see how objective this approach to reviewing murder investigations is structured.

In light of what this presentation has uncovered it behooves us to search for other avenues to correct the mistakes found in all investigations, not just death cases. Because of the magnitude of the crime of murder these get more attention and our efforts should be limitless. The author would proffer that periodic reviews of either type, subjective or objective, would move us in the right direction while increasing the solvability rate. But that the structured and objective approach would better serve the criminal justice system and its victims.

Death, Homicide, Clearance Rates

D37 Postmortem MR and CT in Fire Fatalities

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After attending this presentation, attendees will be able to identify the typical Postmortem Computed Tomography (PMCT) and Postmortem Magnetic Resonance (PMMR) imaging findings in fire fatalities, identify the burn related findings that are seen better on imaging than at autopsy, and describe the fire-related findings that are not well seen by imaging and those not seen by either imaging or autopsy. In sum, attendees will have a thorough understanding of forensic findings in fire fatalities across the spectrum of the major forensic tests that are currently available.

This presentation will impact the forensic science community by demonstrating that imaging methods provide excellent depiction of charred bodies and the majority of forensically important findings that can be identified in such cases. This presentation will provide the forensic investigator with additional tools and means to reach forensic conclusions as well is to display important findings to non-medical personnel such as family members, the police, members of the legal profession, and jurors.

This presentation will describe the evaluation of burn victims using advanced forensic imaging (including PMCT and PMMR), detail the typical imaging findings on both modalities, and finally compare the imaging results with results from traditional autopsy and other forms of forensic investigation to highlight the strengths and weaknesses of the various techniques in fire death investigation.

A retrospective review was performed of burn fatalities who were evaluated at our institution by both forensic imaging (either PMCT,

PMMR, or both) and traditional autopsy. The fire-related imaging findings were evaluated and the frequency of injury type and location where recorded. A description of the typical imaging findings is provided in addition to a detailed pictorial review. Finally, the autopsy related findings are compared to the results of imaging. These comparisons are discussed, as is a comparison with results of other published studies on forensic findings in fire related deaths.

Nearly all typical autopsy findings in charred bodies are visible in PMCT and PMMR, including: thermal tissue loss, large areas of skin splitting, heat epidurals, separation of the inner and out tables of the skull, contractures, fire related and non-fire related fractures, organ protrusion, and puppet organs. Imaging by PMCT better demonstrates internal gas collections. PMCT also better demonstrates global findings such as the distribution of debris that may be present and the distribution of fractures in the skeleton as a whole. PMMR best display the rarification of bone marrow that can occur in bones exposed directly to flame, a finding that is difficult to dissect and therefore not often seen at autopsy. Autopsy better demonstrates airway soot deposition, minute surface changes (for example crow's feet), coloration changes in the surface of burned bone, and the fine details of fracture margins. Neither autopsy nor imaging can identify carbon monoxide, although both can be used to collect toxicology samples.

In conclusion, forensic imaging by PMCT and PMMR is well suited for evaluation of fire fatalities. The combination of advanced imaging with the traditional external forensic examination can identify the majority of known and forensically important fire-related findings. PMCT and PMMR can be a useful adjunct or, in selected cases, possibly a replacement for traditional autopsy in the investigation of fire-related deaths.

Radiology, Fire, Virtopsy

D38 Women: Invisible Territory of Violence in Colombia

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After attending this presentation, attendees will understand the reality of female victims of violence, specifically of domestic violence and spousal abuse in Colombia. The figures according to the 2010 report published by the Reference and Forensic Information Division of the National Institute of Legal Medicine, are a matter of concern. Two cases of female victims of domestic violence and spousal abuse will be presented.

This presentation will impact the forensic science community by providing figures that prove how violence against women is a serious problem in Colombia. Two cases of female victims of spousal abuse who arrived at the coroner's office will be presented. Attendees will conclude that action is required to address these cases in an integral manner. The problem requires involvement from both criminal justice officials and health care professionals, who must create awareness and educate judicial officials who deal with domestic violence victims.

When there is spousal abuse, aggressions against women are seldom isolated cases. On the contrary, these actions are systematic attacks that escalate over time in terms of frequency and intensity and may cause serious injuries to the victims. The likelihood of the victim's death as a result of these systematic aggressions is high.

The first case involves a young woman who was frequently battered by her partner. According to her account, after her spouse choked her mechanically, she lost consciousness and sphincter control; forensic examinations revealed that she had dysphonia, multiple small petechial hemorrhages, bilateral punctiform retinal lesions in both eyes, and several bite marks, among others. The patient was medically diagnosed unable to work for ten days. The forensic examiner's report

warned the authorities about the victim's high risk of death. In Colombia, cases where the patient is medically diagnosed as unable to work for less than 30 days are considered misdemeanors and must be settled by the parties. However, the importance of this type of report is that it should be covered by domestic violence laws. In theory, domestic violence laws have different connotations from the legal standpoint. When this woman submitted the medical examiner's report to law enforcement, she was informed that the claim could not be taken and that she could not file a complaint against her abuser because, based on the time of medical disability, it should be settled by the parties, despite the offender's repeated death threats against the woman and her child.

Case two involves a young woman whose fragmented body was found inside several garbage bags in a neighborhood in Bogotá. Seventeen fragments were found. The chest fragment became relevant because it had evidence of a tattoo and multiple sharp force wounds. The body was identified a few days later on the basis of the signs that matched those of a mother of two daughters who had been reported missing by her husband. According to the husband's account, the missing woman had left home after a domestic fight. Investigators suspected that the woman was a victim of spousal abuse and domestic violence by her husband, who was jealous because "his" woman was working. The offender dismembered the victim's body after physically attacking her, which caused her death.

Although significant efforts have been made in Colombia to give women a dignified position in society, legal statutes are still unable to prevent violence against women and establish integral intervention programs aimed at breaking the psychological, emotional, and financial chains that keep women tied to their abusers. Therefore, women are highly vulnerable. Their private spaces, i.e., their homes, can become terrifying places for them and for their children.

Violence Against Women, Domestic Violence, Female Victims

D39 The Relevance of Scientific Evidences in Criminal Investigations of Mafia's Crime: The Experience of "Capaci's Bloodshed" and the Murder of the Judge Giovanni Falcone

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After attending this presentation, attendees will learn the importance of using a strictly objective scientific method to collect evidence to solve complex judiciary cases concerning Mafia's crime.

This presentation will impact the forensic science community by presenting scientific data and images about the brutal murder of the Judge Giovanni Falcone during the so called "Capaci's Bloodshed."

For over thirty years, the Institute of Legal Medicine of Palermo has worked with the judiciary bench in order to obtain close to certain judgments about the causes of death and the instruments that have caused it, even and especially in range of many different crimes that the mafia committed. In regard of scientific and didactic function of forensic medicine, the Institute of Legal Medicine of Palermo finds it essential to highlight the importance of scientific evidence in any investigation relating to heinous Mafia's crimes. The goal of this research was to gather scientific data, not only forensic, but also those related to other sciences (ballistics, forensic genetics, judicial inspection), from forensics police and any other specialists in the most important killings by mafia during the past few decades.

On May 23, 1992 at 5:58 p.m., while the judge was returning from Palermo's airport, driving one of three armored cars that made up his

escort, he was killed by a violent explosion of TNT along with his wife Francesca Morvillo and three other men in his escort. Only after a thorough judicial investigation which included rebuilding the exact dynamics of events, the investigators were able to trace the names of the murderers who carried out the explosion. In particular, through careful analysis and thorough inspections of the sites, it was established that the car driven by Judge Falcone was placed in the middle in vertical line between the two escort cars; the group's first car with three bodyguards, a brown "Fiat Croma" was fully engulfed in the explosion, and remains were thrown over the opposite traffic lane. The second car, the white "Fiat Croma" driven by the Judge crashed against the concrete wall; Giovanni Falcone and his wife Francesca Morvillo were thrown violently against the windshield and both died during transport to hospital due to serious internal hemorrhaging, while the driver, who took the back seat, survived with no injuries. The bodyguards in the third car, a blue "Fiat Croma," escaped miraculously, as the people that at the time of the attack were passed with their cars in the highway.

Only after time, surveys suggest that the explosion was caused by a charge of five pounds of dynamite placed in a tunnel under the highway and that it was triggered remotely by Giovanni Brusca, an assassin commissioned by Mafia boss Toto Riina. Brusca was located on the top of the hill facing the highway. This location was discovered through a botanical survey carried out on some broken branches and through forensic tests carried out on cigarette butts found in large quantities there.

This work would show how often the resolution of complex legal and forensic issues is only possible thanks to scientific evidence that is relevant and conform to the rules of its scientific field of reference, accompanied by appropriate guidance to clarify the reading and interpretation of scientific data (e.g., specificity and sensitivity of a given test). In the research of the evidence, therefore, it can not be left aside a strict objective method so that, therefore, only a multidisciplinary approach (legal, forensic, and scientific), with the final purpose to collect scientific evidence, delivers the resolution of complex cases.

Scientific Evidence, Mafia's Crime, Giovanni Falcone's Homicide

D40 Experience of Assisted Suicide in Switzerland

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After attending this presentation, attendees will know about the Swiss experience of assisted suicide, especially laws, associations performing assisted suicide, and the position of medical doctors and of the population.

This presentation will impact the forensic science community by giving information on assisted suicide, which is allowed only in some countries, like Switzerland and a few states in the United States.

Access to effective palliative care offers a dignified end of life to most patients. However, this option doesn't always correspond to patient expectations. Some patients would ask for euthanasia, which is, in most countries, not allowed. Some other patients prefer to end their lives by asking for assisted suicide from their doctor.

Assisted suicide is authorized in Belgium, Holland, Luxemburg (since 2008), Switzerland and several states in the United States – Oregon, Washington (since 2009), and Montana (since 2009).

In Switzerland, some associations offer assisted suicide, under certain conditions, to sick people wanting to end their lives. These associations are, essentially, for the French part of Switzerland, "EXIT-ADMD" (association for the right to die with dignity), as well as "EXIT Deutsche Schweiz" and "Dignitas" (in the german part of the country).

When patients fulfil certain conditions or criteria, EXIT-ADMD provides to the patient sodium pentobarbital which causes rapid loss of

consciousness and death usually within 30 minutes without suffering. The five required criteria are: discernment capacity, incurable disease, serious and repeated asking, severe physical and/or psychological suffering, fatal prognosis or severe invalidity. Most patients asking for assisted suicides suffer from cancer, neurological (like Parkinson disease, multiple sclerosis or lateral amyotrophic sclerosis), cardiovascular, or respiratory diseases.

The rate of assisted suicide in Switzerland has increased during the last fifteen years, but appears to be stabilizing. Probably the number of cases didn't increase so much, but more of them were officially announced, as doctors know better about their rights concerning assisted suicide. This kind of death represents about 25% of suicides in Geneva, but only a minor part of all deaths (about 0,4%).

The practice of assisted suicide has prompted numerous debates among legal, medical and ethical professionals. It is sometimes mistaken with euthanasia, which is quite different because the act is then performed directly by the doctor. The problem of patients who are, for physical reasons, not able to perform assisted suicide (for example not able to swallow or completely paralysed) is still not resolved.

In 2009, 166 members of EXIT-ADMD asked for assisted suicide and 69 assisted suicides were performed. Other have been refused, some of these patients finally died from natural death or are still alive.

Doctors have been asked about their position on assisted suicide. Some of them (2/3) had already been questioned by their patients. Most of these doctors are favourable even if they're not sure to be willing to practice assisted suicide themselves. Two third of them said that assisted suicide should be allowed in nursing homes and hospitals. The problem in nursing homes is that the patients live there and should have the same rights as people living by their own.

Recently, a sample from the Swiss population was questioned and 75% were favorable to assisted suicide for patients with incurable diseases which cause physical and/or psychological suffering, or for very old people. Moreover 63% of the population say assisted suicide should be authorized by nursing homes.

Assisted Suicide, EXIT Association, Switzerland

D41 The Effectiveness of Interdisciplinary Forensic Science Education for Multiple Audiences

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After attending this presentation, attendees will understand the importance of educational initiatives in forensic science at all levels and audiences.

This presentation will impact the forensic science community by illustrating the critical need for integrated forensic education on all levels - middle school, high school, and college students and their teachers, as well as law enforcement and judicial practitioners. A discourse between these often disparate groups within the forensic science community is essential to elevate the perception of forensic science as a valid and scientific field.

Recently, Fradella et al. (2007) described the forensic science field as "plagued with poor education and training" while the National Institute of Justice Special Report on Education and Training in Forensic Science (NIJ 2004) assessed the educational training needs of the forensic science community as "immense." Holland et al. (2006:30) acknowledge that all too often, individuals working in the realm of forensic science may have limited knowledge of crime scene evidence collection, processing, analysis, and presentation of this evidence in a court of law. They go on to state: "continuing this trend is unacceptable,

as forensic science is the essential link between the crime scene, the forensic laboratory, and the legal system.” It is also clear that many of the recent criticisms of the scientific credibility of the field as well as the response to these criticisms (as evidenced by this year’s AAFS theme of “Reliable, Relevant and Valid Forensic Science”) revolve around issues of forensic science education.

This presentation explores forensic science educational initiatives aimed at different levels and audiences: law enforcement officers working in the field, high and middle school teachers offering instruction in forensic science, and high school and college students interested in forensic science. These initiatives have taken place over a period of several years at Radford University through the RU Forensic Science Institute. Results of these different initiatives are compared and discussed in relation to nation-wide trends in forensic science education.

In 2009, through funding from the National Institute of Justice, the goal was to deliver at no cost to law enforcement officers a series of four 2.5 day workshops focused on “Innovations in Forensic Science”—two of which have already taken place, serving a total of 120 attendees. The target audience was the mid-Atlantic and mid-Appalachian region, an area with numerous small, rural-based law enforcement agencies. Topics of instruction include digital forensics, forensic biology and chemistry, the medical examiner’s role in death investigation, forensic entomology, mass fatality incidents, and forensic anthropology and forensic archaeology. Presenters included a mix of forensic scientists (chemists, medical examiners, criminalists), academicians with many years teaching experience in forensic science, as well as law enforcement specialists working in various forensic science fields. Instruction was based on a combination of lecture, laboratory, and field exercises as well as roundtable discussions. Pre-workshop surveys indicated that digital forensics and forensic anthropology and archaeology were among the areas of greatest interest to attendees. Although law enforcement officers demonstrated a wide range of variation in their knowledge about different areas of expertise in the forensic sciences (based on their education and years of experience), nearly half of the attendees (47.5%) indicated that they had received no training or a minimum of two weeks or less prior training in any of the forensic science topics covered. On a scale of 1-5 (1 being not knowledgeable, 5 being proficient), a mean score of 2.19 on the major topics covered indicated that most attendees felt only slightly knowledgeable about these topics before the workshops. Most attendees felt that the major topics covered were relevant to their jobs. In post-workshop surveys, a mean score of 3.3 indicated a 22.4% increase in knowledge by participants. However, at least 18% of participants indicated little interest in learning about the topics discussed and saw little relevance of these topics to their jobs. These individuals apparently attended solely to obtain the 20 hours of in-service training credit offered for participating in the workshop. In addition, overall attendance of these fully funded workshops was low—statistics indicate that rural police agencies and sheriff’s offices with small staffs have little financial opportunity to send their officers to forensic science institutions for training.

The results of these educational initiatives in forensic science aimed at law enforcement officers are compared in this poster to similar ones for high school and middle school teachers and students. Significant differences are found in terms of interest, participation, and application of materials taught. It is concluded that encouraging a collaborative discourse between the often disparate communities of criminal justice and forensic science teachers, students, and practitioners is greatly needed.

Forensic Science, Education, Interdisciplinary Training

D42 A Study of Fingerprint Literature as a Basis for Educational Curricula

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After attending this presentation, attendees will leave with an understanding of how content analysis may be used to create a basis for academic curricula in professions where a significant amount of academic literature exists, but no standard curricula have yet been created.

This presentation will impact the forensic science community by emphasizing the value of curriculum development in forensic science.

Forensic science, being partially born from the practice of law enforcement and the needs therein, does not have standard academic curricula available for many of its subdisciplines, such as firearms, tool marks, and questioned documents. As a result, there was a historical shift in some disciplines of forensic science from a science based on research to a science based on application. This shift may potentially prevent a science from growing and progressing as it should.

It is up to the profession to extract its own curriculum with its own sources, including past and existing procedures and peer-reviewed publications. Developing a curriculum would be useful in outlining the scientific foundations from which the science grew, and perhaps more importantly, to promote that continued scientific growth, as well as providing forensic science educators and trainers a basis to develop their own coursework.

Working groups, such as the Technical Working Group on Education and Training (TWGED), have previously recognized the value of curricula. While these projects do develop a consensus curriculum, they can be lengthy and consumptive of resources. This study seeks to use another means to develop a type of consensus curriculum: published content analysis. Content analysis is a method of analyzing communication in order to produce an objective and quantitative assessment of the content within. It can do this by various methods, including word counts, frequencies, or spatial and time analysis. Content analysis has been used to compare literature in cases of disputed authorship, to compare writing style and technique, and to quantify the effect the communication had on its audience. The benefits of using content analysis for curriculum development are that the literature used is provided to the public for review and it also consists of a diversity literature that spans over long periods of time.

In this study, a content analysis was performed of nine well-known fingerprint books as a way to develop a curriculum for the fingerprinting and friction ridge profession. Specifically, this study uses the table of contents of each written work to compare the chronological and relative order of topics. The order that is deduced from the analysis will provide an “informational hierarchy” for the subject matter. For example, topics appearing closer to the beginning of tables of content may be more basic, more fundamental, or both. Therefore, when taught, the subject should be treated in a similar fashion.

Content Analysis, Curricula, Education

D43 Field-Purposing Technologies: Placing Forensic Tools Into the Hands of Field Practitioners for Timely Intelligence

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After attending this presentation, attendees will be provided with insight into this leading-edge area of forensic science, including overview of how Department of Defense (DoD) units analyze evidence in the field to develop forensic intelligence, insight into the training requirements of field personnel, overview of the development of field protocols and procedures, examples of portable forensics technologies already deployed, benefits and limitations of on-site analysis, deployable forensics laboratories and reach back support, and a description of the Forensic Technologies CoE technology evaluation process.

This presentation will impact the forensic science community by explaining how these efforts hold the potential of producing dramatic gains in public safety. This combination of technology, quality assurance and support to practitioners at the point of need provides field personnel with the ability to conduct examinations and quickly develop actionable intelligence. In addition, by utilizing proper protocols, practitioners can run tests while maintaining the integrity of the evidence for follow-up laboratory analysis as needed. By deploying our nation's forensic technologies and knowledge into the field, agencies can increase their capability to predict and prevent events rather than react to them.

As the military, law enforcement and homeland security communities are called to meet challenges such as narco-terrorism, border incursions, and terrorist threats; the need for rapid analysis of forensic evidence becomes paramount. To provide field personnel with the forensic intelligence to conduct investigations and aid missions, agencies are equipping first responders and military service members with portable forensic analysis tools. These technologies allow complex analyses to be conducted outside of the conventional laboratory environment. This capability serves to not only expedite the rapid development of intelligence to lead the investigation, but also to dramatically reduce unnecessary processing by already backlogged laboratories.

However, providing practitioners with deployable technologies is only part of the solution. Ensuring practitioners also have the knowledge, skills and support to properly apply these tools to analyze compounds and gather vital forensic data is just as important.

This presentation will provide an overview of how the National Forensic Science Technology Center (NFSTC) has assisted the Department of Defense (DoD) in this effort by developing programs of instruction, providing reach back assistance, and establishing field techniques and protocols. In addition, an overview of the technology evaluation activities conducted by the Forensic Technologies Center of Excellence (FTCoE) will be presented. Through the FTCoE, forensic scientists evaluate emerging technologies by furnishing unbiased information regarding the performance and usability of new tools. These evaluation reports provide agencies with impartial data to assist them in making the selection of the most appropriate technologies for meeting their operational objectives.

These efforts hold the potential of producing dramatic gains in public safety. This combination of technology, quality assurance, and support to practitioners at the point of need provides field personnel with the ability to conduct examinations and quickly develop actionable intelligence. In addition, by utilizing proper protocols, practitioners can run tests while maintaining the integrity of the evidence for follow-up laboratory analysis as needed.

By deploying our nation's forensic technologies and knowledge into the field, agencies can increase their capability to predict and prevent events rather than react to them.

Forensic Intelligence, Portable Technologies, Technology Evaluation

D44 From the Bed to the Bench: Defining the Vaginal and Cervical Environment for Post-Coital DNA Recovery

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After attending this presentation, attendees will understand the cyclic variability in the vaginal and cervical environment across the lifespan that may influence the recovery of seminal DNA following rape.

This presentation will impact the forensic science community by helping attendees understand that there may be reasons for absence/presence of DNA beyond the expected time-frame commonly accepted by the forensic community.

The forensic laboratory community has developed a number of advanced technical methods for DNA recovery. Recently, two important studies have: (1) evaluated recovery of DNA past the historical 72 hours promoted as the outside limits for a rape evaluation evidence recovery; and, (2) compared recovery of DNA evidence from the vaginal and cervical sample collected from rape victims. The impetus for both studies came from scholarly presentations and discussions with advanced practice forensic nurses, physicians, laboratory directors, and forensic nurses. The results from the pilot study with three couples looked at the timing of recovery in the post-coital couples. The results from the small sample was that DNA was found routinely at 3-4 days after coitus, but also at 5-6 days post-coitus, and also 7 days post-coitus using enhanced methods for DNA detection. These results question the prevailing practice of limiting evaluation post-rape to a 72 hour period. In the second study, vaginal and cervical samples were compared for the presence of DNA. The results of this study were that cervical samples produced the positive DNA samples when vaginal samples failed to produce recoverable DNA. Both studies challenge the prevailing wisdom, practice and protocols that direct investigation to limit evaluations to 72 hours and collections sites to the vagina for DNA recovery. Specifically, these studies challenge: (1) the limitation of rape evaluation and evidence collection to 72 hours for recovery of DNA; and, (2) the optimum location for the recovery of DNA in the post-coital sample.

The literature review reveals that the medical literature reports a variety of physical and environmental changes in the genitourinary structures impact fertility. In addition, it is known that the normal appearance of genital and urinary structures change throughout the monthly cycle, are predictable, and documented over the lifespan of the female. Tools have been developed to help classify the changing appearance. However, the research has not quantified the changes in females that includes cyclic variances, e.g., the monthly cycle of a reproductive female, or the expected changes across the life span, e.g., infant, pre-pubertal, pubertal, reproductive aged, peri-menopausal, menopausal, to late menopausal changes.

To complicate the interpretation, the addition of ejaculate to the genitourinary environment, the nature of the semen, sperm and the influence of the cyclic vaginal environment on seminal properties in and out of the environment have not been considered by the forensic community. In addition, the vulvovaginal environment across the life span is not studied in the context of the forensic sciences or recovery of post-coital DNA.

This presentation will lay the foundation for understanding embryology and physiology of the vaginal and cervical environment, and the maturation of the vulvovaginal and cervical structures across the life span. The presentation covers the estrogenic changes and the impact of mixing ejaculate in the environment in the context of the post coital environment with the purpose of laying a foundation for future research questions and explanations for why a forensic sample produced (or did not produce) recoverable DNA.

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DNA, Rape, Post-Coital Environment

D45 Elder Abuse: Keep Your Family Close and Your Wallet Closer

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After attending this presentation, attendees will understand the dynamics of elder abuse, identify three major forms of elder abuse in San Diego County, and identify an at-risk population for financial abuse.

This presentation will impact the forensic science community by raising the awareness of financial abuse in the elder community, showing perpetrator and elder relationships, and highlighting the need for further forensic investigation and research in financial abuse.

Elder abuse is a recognized social problem in the United States. It was first labeled as "granny bashing" in British medical journals in the 1960's but this problem remained poorly addressed until one of the earliest studies in America surfaced in 1979. In 1976 the Subcommittee

on Housing and Consumer Interests noted that no group of American citizens suffered more painful losses at the hands of criminal predators than the elderly. The Administration on Aging had stressed the importance of investigation into elder mistreatment in 1978. Originally studied under the umbrella of family violence, maltreatment of the elderly has received more funding and research attention in recent years. The National Center on Elder Abuse has defined domestic elder abuse as "any of several forms of maltreatment of an older person by someone who has a special relationship with an elder, such as a spouse, sibling, child, friend, or caregiver. The American Medical Association also provided a definition of elder abuse that stated "abuse shall mean an act or omission which results in harm or threatened harm to the health or welfare of an elderly person. Abuse includes intentional infliction of physical or mental injury; sexual abuse; or withholding of necessary food, clothing, and medical care to meet the physical and mental needs of an elderly person by one having the care, custody, or responsibility of an elderly person." Multiple aspects of elder abuse have been examined in the literature including measures for detection, assessment, and documentation. Sexual abuse of the elderly has been documented in several studies, often including victims with functional or cognitive impairment. Sexual homicide is also well documented in the literature. Financial exploitation is the inappropriate use of an elderly person's resources for personal gain, and has become much more prevalent in recent years. Telemarketing fraud, extortion, theft, and credit card fraud has left older adults unable to pay for food, medication, and medical care. Coercion to change a will, signing over deeds, and transfer of personal belongings or giving of material goods without consent all constitute abuse. Financial abuse is expected to increase in the coming years as the population ages. Frequently seen as a valuable and vulnerable target the elderly often have assets that are desirable such as property or good credit. Financial, physical, and sexual abuse are often seen in combination. Although studies have examined the circumstances surrounding abuse as well as theories of causation and characteristics of the abuser and abused, studies of the relationship between the abuser and abused are less well documented. This study examined the abuser relationship, family or non-family, and types of abuse (financial, physical, sexual) in the elderly through evaluation of prosecuted cases of elder abuse by the San Diego County District Attorney's Office. 155 cases of elder abuse were identified in Court records evaluated for the years 1996 through 2009. Incidence of types of abuse are presented as well as findings for statistical significance for abuser-abused relationship, type of abuse, and demographic predictors for financial and physical abuse, as well as future directions for forensic study in elder abuse.

Elder Abuse, Financial, Perpetrator Dynamics

D46 An Interdisciplinary Approach to Child Sexual Abuse Investigation in Colombia

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After attending this presentation, attendees will have a general knowledge about the importance of a multidisciplinary approach in order to do a proper forensic analysis as well as social, legal, and criminal in cases related with sexual child abuse, at the same time attendees also will understand the Colombian forensic work in the reported cases.

This presentation will impact the forensic science community by showing how hundreds of people in Colombia had been found guilty of child sexual abuse without a scientific interpretation of forensic evidence and/or a proper criminal investigation.

Since 1999, when Luis Alfredo Garavito, one of the worst serial killers and child abusers of Latin-America was arrested, the number of accusations of child sexual abuse in Colombia have increased year by year and in 2009 the Colombian Institute of Family Welfare reported

17,000 cases in which most of the victims are children under 14-years-old of which 75% are girls. But it is possible that an important number of these cases are just false reports

Within the Colombian criminal code, child sexual abuse is represented by two kinds of crimes, sexual touching and sexual assault. In the first case there are not any physical evidences in victim's body; while in the second the victim has been penetrated. In accordance with statistics children less than 12 years old are in most of the cases, victims of sexual touching while children up to 13-years-old are victims of sexual assault.

Beginning January 1, 2005, with the implementation of the adversarial system in Colombia, hundreds of people had been found guilty of charges in cases related with child sexual touching and child sexual assault without any forensic evidence or a proper criminal investigation.

Child sexual touching cases around the world as well as in Colombia can be very difficult to prove largely because cases where definitive, objective evidence exists are the exception rather than the rule. When child sexual abuse occurs the child victim sometimes becomes the only witness and the child's statements are usually the only or most important evidence. In such cases, the central issue becomes whether the child's statements can be trusted but neither prosecution nor defense are doing an appropriate legal and/or forensic interview to find the true.

In spite of the high number of accusations and the Colombian State's efforts for protection and prevention, the criminal and forensic investigation of child sexual abuse cases in Colombia is still far away from international levels due to several factors. Within these are an inadequate criminal investigators' training on these kinds of crimes, the analysis, reports, and testimonies of non-forensic experts in the court, manipulation of victims' minds, the use of neither scientific nor technical resources by psychologist and a bad praxis from some medical doctors, especially in rural areas.

Together with this scientific issue, there are other difficulties. On one hand, judges, attorneys, and prosecutors are not trained sufficiently to use and understand physical and forensic evidence but on the other, the mass media and social prejudice about these cases are taking an important impact in judges' minds.

Since 2007 with the new children's protection code, people who are condemned by child sexual abuse in Colombia have no legal benefits even if they confessed to their crimes. This is the only crime that has no benefits for offenders in this country and unfortunately some people are using it for personal revenge or economical interests.

Through a multidisciplinary analysis from the legal context, forensic sciences (psychology and medicine), criminal investigation, and social anthropology, an interdisciplinary team working in some cases for the defense and in others for the victims, will bring real cases, their physical and testimonial evidences, criminal processes and sentences.

Child Sexual Abuse, Forensic Interdisciplinary Work, Crime Scene Investigation

D47 From this Day Forward: To Have and to Hold – Spousal Rape of Asian Immigrant Wives

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After attending this presentation, attendees will better understand salient elements germane to select cases of immigrant spousal rape, and understand gaps and deficiencies in care, evaluation, and guidance for marginalized victims of sexual trauma. This presentation will also heighten awareness and promote collaboration among medical, legal, and

other professionals who may encounter immigrant victims of spousal sexual trauma.

This presentation will impact the forensic science community by contributing to the understanding of sexual violence in marginalized groups of women, e.g., Asian immigrant victims of spousal rape, improving collaboration among all professionals who intersect victims of immigrant spousal rape, and providing a framework for the forensic evaluation of victims of immigrant spousal rape.

During the 1970s, concomitant with the rape crisis movement, society finally admitted the possibility of rape within marriage. It was 1993 before marital rape became a crime in all 50 states. Differences exist in how states implement the laws (NCVC: 2010). In 1993, California's law was amended. The reporting period was expanded to 1 year (vs. 3 years for non-spousal rape). A comprehensive body of research exists on marital rape. What can be said about men who target females that they believe embody mythical stereotypes of Asian women?

Asian Mail-Order Brides –The Circuit of Culture, explored the historically-prized Asian mail order bride industry. Both mass-produced paper catalogues and countless web pages continue to depict a seemingly infinite supply of eager young Asian prospects for marriage. They are, according to Ms. Ho, "submissive, obedient, loyal, soft-spoken, and meek." Other images that come to mind are the "geisha girls, China dolls, Miss Saigons, and the Comfort women that fill the media, books, and popular culture." (Christine Ho, USAsians.net: 2003).

Regardless of their real-life personality traits, a myriad of factors can increase the vulnerability of these women to fall prey to those with the motivation to control and victimize. While mail-order brides are targeted products that advertise cultural stereotypes, these stereotypes are not exclusive to the mail-order bride business.

Barriers exist for all victims of marital rape. For groups that are marginalized, e.g., immigrant women controlled by abusive spouses, the web is a tightly woven noose. Along with expected stressors of sexual trauma, they face fear of deportation, possibility having to leave their children or new, loving relationships.

From the lens of altered cultural perspectives, marginalization, and marital rape, two young Asian women who were likely perceived not as *mail-order*, but perhaps *made-to-order*, by their assailants, legal American citizens will be discussed. Both cases occurred in Northern California; both sexual assault victims faced deportation back to their country of origin. The discussion includes steps taken by the FCNS by a San Francisco Bay Area legal advocacy caucus. The Criminal Investigative Profiler provides a conceptual framework about the assailants to understand the dynamics of the assailants.

Materials and Methods: Case 1: 33-year-old Asian female; an aunt introduced her to her future husband in East Asia. She was approaching age 30 and under family pressure to marry. After dating in her country for a year, they married in the United States. The spousal assaults began shortly afterwards. The duration was 15 months and often included daily episodes of painful anal penetration. The FCNS evaluation occurred 1.75 years after the last episode of sexual assault.

Case 2: 33-year-old Asian female. Three years earlier, an aunt introduced her via email to an American male. She later visited her aunt in California and met the man in person. Forced sexual acts, including sodomy, commenced shortly after the marriage, a few months later. She later learned that her marriage was not legal. Fifteen months after the last sexual assault, she was evaluated by the FCNS.

Discussion: Cracks, Gaps, Barriers, or a Need to Change? These cases cross more than national and cultural boundaries. Superimposed upon the myriad sequellae of sexual assault trauma are a host of ubiquitous factors such as language barriers, lack of medical insurance, isolation, lack of funds, and cultural disparity. Most tragically poignant may be the disbelief that even in America, marital obligation is synonymous with endurance, even with criminal activity. The words of one Asian woman perhaps best summarize the pathos:

“Life felt like a daily torture but I did not know what to do about it. I never imagined that my married life would be like this, but thought that I had to endure the pain because it was my duty as his wife.”

Numerous roadblocks were encountered in efforts to evaluate the first case; lessons learned sped the evaluation of the 2nd case. They also confirmed the glaring gaps in our provision of care and services to these women.

These cases are discussed in an effort to clarify gaps and missed opportunities by the medical-legal system. All women, regardless of their background, language, culture, or circumstances, deserve assistance, and support after such intense levels of prolonged intimate sexual violence.

Immigrant Spousal Rape, Forensic Clinical Nurse Specialist, Criminal Investigative Profiler

D48 Suspect Examinations for Evidence in the Investigation of a Sexual Assault

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After attending this presentation, attendees will be able to list several barriers as to why suspect examinations are not considered, as well as, be able to give examples of when a suspect examination should be considered.

This presentation will impact the forensic science community by expanding knowledge and will review common misconceptions about examination collection and potential interpretation as well as the information that can be obtained during the examination process.

All too often suspect examinations are often overlooked in a sexual assault investigation. Most law enforcement agencies as well as nurse examiner programs have failed to establish appropriate policies and procedures for obtaining comprehensive forensic examinations for sexual assault suspects. The purpose of this presentation is to make the case for the importance of suspect examinations, for the collection of evidence from both the suspect's body and clothing, to explore some of the reasons and barriers as to why they often are not done, and to provide concrete recommendations for overcoming these barriers and using suspect examinations effectively in your community. Any evidence that provides corroboration of the victim's account and documents force or injury is absolutely critical for the investigation of sexual assault. The forensic examination is arguably the most critical component in the aftermath of a sexual assault. The exam has two main goals: (1) to treat the survivor of the assault for any medical injuries that may have resulted from the assault; and, (2) to collect precious evidence that may eventually lead to the arrest, prosecution, and conviction of the offender. At the completion of the examination, the medical forensic report is generated. The suspect examination form will have information that can be impact the investigation of sexual assault. Common misconceptions will be reviewed about examination interpretation as well as the information that can be obtained during the examination process. When evaluating potential sources of evidence, law enforcement professionals often focus on anything that might have transferred from the suspect to the victim; thus, forensic examinations of the victim are seen as critically important. However, keep in mind that any evidence that could potentially be transferred *from the suspect to the victim* may also be transferred *from the victim to the suspect*. Therefore, depending on the type of contact involved in a sexual assault offense, the suspect's body may actually be a better source of probative evidence than the victim's. For example if the suspect forced his penis into the victim's mouth during the sexual assault, his penis maybe a richer source of evidence than the victim's mouth. Clearly, any evidence from the suspect's body that establishes the identity

of the victim will be important in the investigation and prosecution of sexual assault. It is therefore surprising that so few law enforcement agencies routinely collect forensic evidence from the body of the suspect.

It's Not Just About DNA Identification.¹

Yet the importance of the suspect examination is not solely based on the potential for documenting the victim's DNA for identification purposes. Depending on *where* the victim's DNA is found on the suspect's body, it may provide a better idea of the specific acts that were involved in the sexual assault (e.g., penile-vaginal penetration, digital penetration, oral copulation). This type of evidence may be particularly helpful with very young victims or with victims who are under the influence of drugs or alcohol, because they may not recall or may not be able to articulate exactly what happened to them. Evidence of the victim's DNA on the suspect's body can also be important in cases involving multiple perpetrators, where the victim knows that a suspect participated in the assault but is not sure if he penetrated her.

Reference:

¹ Forensic Exams for the Sexual Assault Suspect by Joanne Archambault 2008.

Suspect Examines, Sexual Assault, DNA Collection

D49 Examination of Sexual Violence Victims in Colombia: A New Approach

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After attending this presentation, attendees will learn the reality of the medical examiner's response to survivors of sex crimes in Colombia. The introduction of new elements in routine victim examinations will be proposed.

This presentation will impact the forensic science community by introducing new technical and technological tools that will provide medical examiners with new basic equipment for the collection of evidence from sex crimes survivors in Colombia. Three sexual assault cases evaluated by the Forensic Clinical Services of the Colombian Institute of Legal Medicine and Forensic Sciences will be described.

A large part of the Institute's casework is represented by forensic examinations of victims who report sexual abuse. According to the 2010 Masatugo publication, 73,395 sexual violence victims were examined between 2004 and 2008. These victims were primarily girls and female teenagers under 18 years of age. Forensic examinations of sexual abuse victims require a thorough search for physical evidence, which is essential for prosecution. Although sexual assault reports are less frequent, the special characteristics of these crimes, where physical force and contact between the perpetrator and the victim are involved, require expertise of medical examiners in terms of finding as much evidence as possible. The other element of the investigation is the investigators who work in both sexual abuse and sexual assault cases. Their efforts involve interviewing victims, understanding the context of the crime scene, and obtaining additional information to clarify the facts. Witness presentation helps prove the case beyond reasonable doubt. However, cases where no physical evidence exists are a huge challenge. Until recently, forensic examinations of sex crime survivors in Colombia were visually conducted by medical examiners. This promotes the loss of imperceptible evidence that examiners may miss. Obviously, this is not only detrimental to the victim, but it promotes impunity. Health centers in charge of sexual assault victims' attention should be equipped with new technical tools that help medical examiners minimize the loss of physical evidence. The first recommendation is the use of alternate light sources (ALS) for both the victim's physical examination and her/his clothes. Alternate light sources contribute to the detection of evidence frequently found in unusual places. The use of dermatologists magnifier

glasses is also recommended. Toluidine blue staining and colposcopic examinations should be part of the process.

In these cases, alternate light sources, dermatologic magnifier glasses, Toluidine blue staining, and colposcopy were systematically used. These cases prove that these instruments may help medical examiners find relevant evidence. Consequently, these tools should be part of the basic equipment required by health care centers responsible for these cases. This new procedure will give the forensic community the arguments required to support the need for the routine use of these instruments.

Sexual Assault, Physical Evidence, Basic Equipment

D50 Pictures From the Dark Side — Inaccurate and/or Biased Sexual Assault Examination Reports From a Defense Expert's Prospective

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The goals of this presentation are to: (1) better understand that sexual assault examination reports need to be carefully evaluated before and at trial; and, (2) to demonstrate that conclusions drawn by the sexual assault examiner may be inaccurate and/or biased and the examinations themselves incomplete with little or poor documentation to substantiate the sexual assault examiner's conclusions.

This presentation will impact the forensic science community by presenting the sexual abuse examination as an important tool in law enforcement that needs to be carefully guided to be a fair, honest asset to both defense and prosecutors in their quest for justice.

Synopsis: Actual examples of SART examination photos and statements by sexual assault examiners will be shown. They will include those that were used in trials that have led to convictions in which the information given to the jury was not accurate. The interpretation of the photos themselves could be inaccurate or the information from the photographs was interpreted in such a manner as to suggest sexual assault had occurred. This could be whether this was an accurate interpretation or not and even if accurate ignored the fact that there were other possible causes that would explain the findings.

The interpretation of the sexual assault examination reports also leads police to make arrests and prosecutors to charge in situations that do not warrant these actions.

The issue as to the genesis of the inaccurate examination reports will be discussed. Is it just from the lack of experience and knowledge of the examiner or does advocacy become a major factor? Cases on point from inexperienced and very experienced examiners will be shown and discussed.

Problems in selecting candidates to become sexual assault examiners will be discussed as will the lack of consistency in the training and continued qualification of these examiners. The lack of consistency in standards for peer or case review will be discussed.

From experienced centers we see excellent reports which include quality photographs and a reporting of the findings in a professional manner with accurate dispassionate discussions of the findings and their possible interpretations. However, with the rapid expansion of the sexual assault examination program there is now a major difference in the quality of the reports from various centers. For example in the last six cases reviewed from one northern state no photographs were taken.

The manner in which sexual abuse examiner groups has escalated in the last twenty years with their own ability to qualify their examiners has led to a marked differential in skill sets of the examiners in various parts of the country and in the same states. These groups are either privately owned, owned by emergency rooms or rape crisis centers and contract with local hospitals or local law enforcement agencies to deliver this

service. This does lead to the consideration of a possible conflict of interest.

With the need to fill their staffs and meet their contracts, these sexual assault examiner groups at times must use less than experienced examiners with the expected results. This leads to situations in which a less experienced sexual abuse examiner's report is presented in court and is challenged leading to more senior member of the group rebutting the challenge to the report in a protective but less than accurate supplemental report. Examples of this will be shown.

Sexual Assault Examiner Qualifications, Conflict of Interest, Trial Preparation

D51 Characterization of Soil Composition Using a Wavelength Dispersive Spectrometer X-Ray Mapping Method

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The goal of this presentation is to describe an electron microprobe method using stage mapping, which is being developed to help quantify soil characterization. Example soils that highlight the issues involved with developing the methodology of this approach for soil characterization will be discussed.

This presentation will impact the forensic science community by helping provide additional statistically defensible compositional parameters for the comparison of soils.

An electron microprobe method using stage mapping, which is being developed to help quantify soil characterization will be described. Example soils will be discussed that highlight the issues involved with developing the methodology of this approach for soil characterization.

Adoption of this, or similar methods, once developed for the characterization of soils will help provide additional statistically defensible compositional parameters for the comparison of soils.

Comparison of soil types can be subjective and dependent of the experience and biases of the forensic microscopist or investigator. Descriptions of soil often include aspects such as color, size fractions, general type – sand, silt, clay, amount of organic matter, and mineral composition. Most of these aspects rely on the experience of the examiner for adequate description. Therefore data from different examiners, especially data provided by examiners from different localities or organization, are often not directly comparable. Efforts to develop a standard method for semi-automatic compositional characterization of soils using stage mapping methods in an electron microprobe with wavelength dispersive spectrometers (WDS) are ongoing. This approach is developing in tandem with an approach utilizing an automated scanning electron microscope with energy dispersive X-ray spectrometer (EDS).

Both the WDS and EDS approaches utilize a sieving process to portion out grains based on size, thus capturing statistics for the size of the soil particles. One size range at a time is characterized by composition. Additionally, morphology information can also be obtained. However, at this time research is focused on completing development of the algorithm for uniquely identifying the mineralogical composition of the grains. A sampling of one size fraction is prepared as a polished grain mount for analysis in the electron microprobe. The WDS approach utilizes element ratios and creates element ratio maps on a pixel by pixel basis created from elemental maps captured by the WDS system. The ratio of elements contained within different crystal structural sites of the soil minerals is unique to each mineral group. Therefore the abundance of the mineral types can then be determined from the element ratio maps. Each map can consist of millions of pixels, each representing a compositional analysis. The abundance of each mineral type for one size fraction can then be combined with the data acquired for the other

size fractions of a soil sample to provide a mineralogical histogram for the soil sample as a whole. In other words a quantitative description of the soil sample is produced containing statistical information pertaining to the size and to the mineralogical composition.

The latest progress in our efforts to refine this method will be presented. Ultimately, adoption and use of this method would improve quantitative comparison of soil samples from different localities. This would reduce subjectivity involved with soil comparisons and potentially increase the forensic usefulness of soil comparisons.

Quantitative, Soil Comparison, X-Ray Mapping

D52 The Application of *In-Situ* Reflectance Spectroscopy for the Detection of Mass Graves

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After attending this presentation attendees will be able to understand how in-situ reflectance spectroscopy could aid in the location and detection of single or mass graves, will appreciate the potential for further research to be conducted at human natural burial grounds within the United Kingdom, will recognize that remote sensing in the form of *in situ* reflectance spectroscopy has definite potential to be applied in a soil forensic context, and will recognize the importance of conducting research on human burials rather than simulated or animal burials.

This presentation will impact the forensic science community by offering a quick, non-invasive tool which can be utilized within the initial search, location, and detection of mass graves.

Research was conducted to investigate the findings published within the paper "The Application of Remote Sensing for Detecting Mass Graves: An Experimental Animal Case Study from Costa Rica" (Kalacska et al. 2009). Kalacska et al. (2009) conducted spectral measurements using both *in situ* reflectance measurements and hyperspectral analysis on two simulated mass graves (one containing cattle and the other, disturbed soil) over a sixteen month period. The original study was conducted in the tropics of Costa Rica and thus, a recommendation was made for further research to be conducted in alternative climatic zones to ensure that the extent of the application could be ascertained and determine whether this form of remote sensing could provide the international community with a preliminary detection tool for mass graves.

Therefore, research was conducted into the application of *in situ* reflectance spectroscopy, monitoring within the visible to near infrared (350-2500nm) to ascertain whether there was potential for this technique to be used as a quick, non-invasive method for the detection and differentiation of soil from grave and non-grave areas. The *in situ* reflectance measurements were collected using a portable fibre type vis-NIR LabSpec Pro, Near Infrared Analyser from Analytical Spectral Devices Inc (ASDI), USA, were conducted.

Therefore, to assess the application of *in situ* reflectance spectroscopy, two investigations were designed and undertaken to allow a new research methodology to be created; a controlled laboratory based pilot study and field work, focusing on four natural burial grounds within the United Kingdom.

The methodology developed for the controlled laboratory pilot study included simulated mass graves containing organic minced beef being exposed to 30°C over a period of six days. Reflectance spectra were obtained on days one and six of each of the experimental weeks; for statistical reasons the pilot study was repeated four times over four consecutive weeks. The collected spectra from the four pilot studies were subjected to Principal Component Analysis (PCA) to ascertain whether the spectra obtained from the soil from grave and non-grave areas on day six were significantly different to those collected on day one.

Consequently, it was found after subjecting all of the reflectance spectra obtained to PCA that within all of the similarity maps produced from the laboratory study, clear differentiation was observed between the spectra collected from grave areas in comparison to those from the non-grave areas on day six.

The second of the two investigations, the field work, was conducted at four Natural Burial Grounds within the United Kingdom. An operating procedure was devised which was employed for all of the twenty four graves measured; thirty three reflectance spectra were obtained from the soil from both grave and non-grave areas. The spectra collected from the natural burial grounds were also subjected to PCA, after which it was found that differentiation between the spectra obtained from the grave and non-grave areas was achieved within 75% of the graves measured, whereas, 25% of the similarity maps produced indicated that no differences between the spectra obtained existed.

In conclusion, it was found from conducting both a controlled laboratory study and also field work, that *in situ* reflectance spectroscopy monitoring within the visible to near infrared does have the potential to be utilized as a preliminary tool for the location and detection of single or mass graves during site assessment.

The aim of site assessment is to locate and define a potential area which may contain a mass grave; during which many disciplines are pooled to create a multidisciplinary team. Any information regarding the potential location of a mass grave is collected and investigated. The difference sources of information often utilized during area location are eye witness testimony, aerial imagery and geophysical survey; as these sources enable the investigation to become more focused on one particular area (Anderson et al. 2008).

Within literature it is documented that one of the most successful methods of mass grave location was found to be eye witness testimony; where evidence is often sought to corroborate the information obtained, to determine the mass grave location; this has been seen in countries such as Bosnia.

Due to mass graves becoming the stimulant for criminal proceedings increasingly over the past decade, the emphasis placed on recovering evidence utilizing forensic principles has also increased dramatically. Consequently, the first standard operating procedure for the investigation of mass graves was published during 2008 by Cox et al., within which the forensic principles of site integrity and continuity were emphasized. Particular weight was placed on the methods used to detect mass graves, where the least intrusive techniques are employed prior to the more intrusive methods, to ensure that the site's integrity and also the integrity of the evidence is maintained.

Consequently, it is intended that this application of *in situ* reflectance spectroscopy could be used as part of the process towards confirming the information obtained from eye witness testimony or aerial photography during initial assessment missions; particularly during the processes of area and site location. The method proposed within this research is non-intrusive, quick and the instrument is portable and would therefore be a valuable addition to the multidisciplinary methods currently utilised within the location and detection of mass graves.

Mass Graves, Humanitarian, Remote Sensing

D53 Asian Forensic Sciences Network - Report on New Regional Collaboration

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After attending this presentation, attendees will have an appreciation of the Asian Forensic Sciences Network and developments in the forensic sciences scene in Asia.

This presentation will impact the forensic science community by providing a better understanding of the network, which will help to open up collaborative and co-operative opportunities, and promote closer interaction between counterparts in the North American continent and those in Asia.

Regional associations, such as the American Society of Crime Lab Directors (ASCLD), the Academia Iberoamericana De Criminalistica Y Estudios Forenses (AICEF), Senior Managers of Australian and New Zealand Forensic Laboratories (SMANZFL), and the European Network of Forensic Science Institutes (ENFSI) have been formed over the years to bring forensic science communities in various regions together to discuss common issues.

In 1999, the United Nations International Drug Control Programme (UNDCP), forerunner of the United Nations Office on Drugs and Crime (UNODC), organized a regional Consultative Meeting for the Heads of Drug Testing Laboratories in Southeast Asia in Hong Kong SAR. This led to the publication of an annual regional newsletter *DrugNetAsia*. This newsletter has served as a platform for information sharing among the drug testing laboratories in the region.

In 2006, DNA scientists in the region met at a regional Symposium on Forensic DNA and Population Statistics Workshop held in Singapore, and discussed issues of common interest. This was followed a year later, by the formation of a regional Forensic DNA Profiling Workgroup arising from the perceived need to share information efficiently after the 2004 Asian tsunami. In the same year, Dr. Barbara Remberg of UNODC vetoed the idea of forming a regional forensic science network during a regional UNODC project workshop on precursors and illicit drugs.

In October 2008, representatives from six national forensic institutes in the region converged in Singapore to discuss the issue of the formation of a regional forensic science network. The six institutes are: Department of Scientific Services, Brunei Darussalam; Department of Chemistry, Malaysia; National Bureau of Investigation, Philippines; Central Institute of Forensic Science, Thailand; Forensic Science Institute, Vietnam and Health Sciences Authority, Singapore. Dr Barbara Remberg of UNODC and Prof Jose Lorente, International Liaison Officer of AICEF were also present at the meeting. This meeting gave birth to Asian Forensic Sciences Network (AFSN) which will henceforth serve as a collective voice for the forensic science community in Asia.

In November 2009, the network was formally inaugurated in Kuala Lumpur, Malaysia with adoption of a formal constitution and election of the AFSN Board. Three technical working groups (DNA Workgroup, Illicit Drugs Workgroup, and Trace Evidence Workgroup), and the Quality Assurance and Standards Committee were formed.

The Second Annual Meeting of AFSN was successfully organized in Brunei Darussalam in May 2010. The program included a number of workshops and scientific meetings, with poster sessions as well as the business meetings and the annual general meeting. At the AGM, AFSN signed a memorandum of understanding with the International Forensic Strategic Alliance (IFSA), to work together with other regional networks to further strengthen collaboration and co-operation in the forensic arena globally. A toxicology workgroup was also formed to promote technical discussion and advancement in this discipline. The membership of the network has grown from the initial six institutes to a total of eighteen covering eleven countries in Asia.

The presentation will elaborate on the goals and objectives of the network, and a general introduction to the profile of its members and the ongoing work of the workgroups. The presentation will also discuss the challenges that members of the network face in providing quality forensic scientific services to their communities.

Regional Network, Asia, Forensic Sciences

D54 An Overview on the Wood and Hair Digital Images Databank Project of the Brazilian Federal Police Anatomical Laboratory of Biological Samples

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After attending this presentation, attendees will understand details about the Brazilian initiative concerning the use of anatomical features to identify wood and wildlife.

This presentation will impact the forensic science community by showing some specific aspects of the anatomic analysis adopted by the Brazilian Federal Police Forensic Team that works with environmental crimes (deforesting and wildlife) to identify the seized biological material (wood and hair).

Brazil, as a mega-diverse country, has an ecological relevance with its great variety of ecosystems, some of them considered the richest of the world (e.g., Amazonia, Atlantic Forest, and Cerrado), but are seriously threatened by a sort of environmental crimes. In Brazil, the Federal Police has the duty of the judiciary police, established by the Federal Constitution. Among the several acting areas (such as fighting drug trafficking, money laundering, cyber crimes, among others), recently, the Federal Police has developed a specialized intervention investigating and performing various operations to combat environmental crimes in areas under the authority of the Federal Government (Indian Lands, Federal Conservation Units, Public Forests, and Public Lands). Great effort has been spent in selection, hiring and training of skilled professionals, as well as improving infrastructure and logistics.

This presentation describes the deployment of the Anatomical Laboratory of Biological Samples to aid in forensic examination of seized material (wood and hair) subject to federal criminal investigation, arising from arrests in cases of environmental crimes (under the Brazilian Environmental Crimes Law), such as deforestation, transport/trade of illegal flora products, wild animal trafficking, illegal hunting, etc. The National Institute of Criminalistics of the Technical-Scientific Directorate of Federal Police is a modern forensic complex, with over 20,000 m² of floor space, located in Brasilia. Its facilities are divided into sectors and laboratories that comprise the most different areas of expertise (accounting, ballistics, chemistry, computer science, and environmental, among others). The Anatomical Laboratory of Biological Samples is part of the Area of Expertise of Environment that, because of its recent and multidisciplinary character, has a great need and momentum of expansion and development. The exams of materials seized are performed on a workstation composed of a binocular microscope coupled to a high resolution digital camera, allowing evaluation and record of microscopic images of layers of biological samples, which is thus compared and feeds digital database hosted on the intranet of the Federal Police and accessible to federal experts distributed throughout Brazil. The Anatomical Laboratory is particularly useful in actions to refrain the illegal logging, when there is no possibility of dendrological identification by leaves, fruits, flowers and seeds, as well as the trafficking of wild animals, illegal hunting and other forms of crimes against wildlife, which demanding the identification of parts of animals by examining their morphological and anatomical structures. These crimes cause several damages to the society affecting soil, water, flora and fauna, and represent a usurpation of the Brazilian public property and a threat to the national genetic heritage. The anatomic identification of wood takes place, either by a naked eye exam, from the general characteristics (odor, color, grain, etc.) as by anatomical features (layout, distribution, density, size of vessels, parenchyma, fibers)

visualized with increases of 10 to 80x. Similarly, the identification of wild mammals is done with the analysis of anatomical structures (cuticle and medulla) with species-specific features present in certain regions of the hair (rod and shield). In general, are also used increases of up to 80x optical with additional digital magnification (up to 500x). Examining the image of the wire capillary allows identification which occurs through the morphology of the scales of the cuticle (the hair surface region) and the characteristics of their bone marrow, located within the capillary structure. The records obtained feed electronic databases consist of anatomical and morphological information extracted from images generated by a set of optical stereoscopic vision with increased optical to 80x, plus a digital camera to record real-time image. This set also features dual light source and is guided and connected to a personal computer with software for viewing, measuring and storing images of anatomical elements, allowing the realization of statistical calculations and enhancement of images, as well as the information store. Operations to repress environmental crimes have intensified resulting in the arrest of several involved, but it is worth noting that, to convict the defendants, it is imperative to be demonstrated the materiality of the crime, namely that the material aspects to confirm the crime are presented. The fight against illicit environment acts depends on proper instruction of police investigation and lawsuits with the aid of good forensic expert reports.

Wood Exam, Anatomic Identification, Hair Exam

D1 The Society of Medicolegal Death Investigators (SOMDI)

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The goal of this presentation is to review the history of the medicolegal death investigator profession, to introduce medicolegal death investigators and forensic scientists to the Society of Medicolegal Death Investigators (SOMDI), and to explain why SOMDI has been formed, its goals and objectives.

This presentation will impact the forensic science community by discussing why/how the Society of Medicolegal Death Investigators was created to provide medicolegal death investigators with a professional membership organization to assist in their training, education and professional development.

Medicolegal death investigators are lay individuals employed by medical examiner, coroner offices, and private organizations to investigate violent, suspicious, and sudden unexpected deaths. There are more than 3,100 counties within the United States; each jurisdiction requiring some type of death investigation system. It is a conservative estimate that there are more than 8,000 people currently serving as death investigators in these medicolegal jurisdictions.

Medical examiner and coroner offices in the United States first began employing lay medicolegal death investigators (MLDI) in the late 1960s. This occurred as medical examiner and coroner offices recognized the need for independent death investigations to be conducted by their staffs. These investigators are responsible for representing the medical examiner or coroner at the death scene. They take charge of the decedent's body and actualize the subject at the scene of death. They develop pertinent scene-related information. They are responsible for ensuring that the subject is conveyed from the scene to the forensic office for examination and that a balanced death investigation is performed with local law enforcement authorities.

Investigators develop the decedent's demographic information and medical/social/occupational/criminal history. They establish the person's identity. They then are responsible for locating and notifying the decedent's next of kin. This need is magnified because few forensic pathologists conduct scene investigations due to time constraints.

After several years of effort by veteran medicolegal death investigators working on a Technical Working Group for Death Investigation; the National Institutes of Justice published the *National Guidelines for Death Investigation* in December 1997. Adopting those guidelines, the American Board of Medicolegal Death Investigators (ABMDI) was created in 1998 and began operation at Saint Louis University School of Medicine in St. Louis, Missouri. In 2005, the ABMDI was accredited by the Forensic Specialties Accreditation Board. Two levels of ABMDI certification now exist – the basic level (Registry) and advanced level (Board). Currently there are more than 1,000 ABMDI Registered and 150 Board certified medicolegal death investigators worldwide.

In February 2009, the National Academy of Sciences released their report, *Strengthening Forensic Science in the United States: A Path Forward*. The report emphasized the future needs for forensic practitioners: mandatory professional certification, development of practice standards and adequate training and continuing education opportunities.

In response to that report, a new professional organization, the Society Of Medicolegal Death Investigators (SOMDI), has been created specifically for the medicolegal death investigator forensic practitioner. SOMDI is expected to begin operations in early 2010. Its purpose is to promote medicolegal death investigators training, education, and encourage to ABMDI certification for its membership. SOMDI is expected to provide medicolegal death investigators with an association dedicated to their specific needs and encourage professional development and networking opportunities. SOMDI is expected to provide the membership a forum for exchange of information, ideas, and experiences. Standards for medicolegal death investigators will be discussed, formulated, and scrutinized for future adoption by the membership. A list serve and website will be developed to support membership-wide communications. In the future, SOMDI will conduct membership meetings in conjunction with other forensic organizations to foster collaborative projects.

This presentation will provide attendees updated information as to SOMDI's goals and objectives, membership criteria, and organizational applications.

Medicolegal Death Investigators, The Society of Medicolegal Death Investigators, SOMDI

D2 Experiment Design for Taphonomic Studies: Improving Research Designs, Data Acquisition, and Collaborative Research

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After attending this presentation, attendees will have learned ways to improve taphonomic experimental designs which will improve the science produced, increase data acquisition, decrease monetary expense, and increase collaboration between scientists practicing forensic anthropology, archaeology, and paleontology.

This presentation will impact the forensic science community by outlining a philosophy of research design that, if followed, will improve the scientific quality of taphonomic studies, and increase collaboration between scientists practicing different historical sciences. The collaborative philosophy combined with improvements to experimental design will yield quantifiable reproducible data making the interpretations derived more defensible and rigorous. In addition, collaborative research designs maximize data acquisition per monetary expense which improves both study resolution (discriminatory power) and efficiency.

Applied forensic sciences are, by their nature, historical sciences; observations are collected in the present and used to reconstruct the past. Analytically the fields of archaeology and paleontology perform an identical task; however, their data sets are collected in different ways. It is not surprising that there is an observational and experimental taphonomic literature in all three fields, which has largely developed independently of each other, though there has been a long and productive exchange between anthropology/archaeology and the forensic sciences.

Given that all three fields are interested in the same processes, albeit at different temporal scales, similar experiments and observational studies have been performed in each field. Forensic experiments typically focus on early stages of decay, while archaeological studies focus on longer durations of exposure into disarticulation.

Paleontological studies are often even longer in duration since the assemblages studied are frequently accumulations formed through thousands to hundreds of thousands of years. Consequently the studies performed by each group focus on different time frames which often only partially overlap. Needless time, resources, and money are spent performing experiments on only portions of the taphonomic history of a set of remains. If members from the three fields collaborated to perform one experiment from inception and experiment design to publication, all three fields would benefit from a coherent longitudinal data set. Rather than performing three experiments, one would suffice, and the results from different phases could be used by each principle investigator as per their research interests.

Although the three disciplines actively study taphonomy, there are only two general study types: observational and experimental. Observational studies provide essential initial data with which hypotheses can be erected. At present there is voluminous literature involving observations and experiments upon which one can erect hypotheses concerning most taphonomic processes. Consequently it is time for taphonomy to adopt hypothesis driven science utilizing the method of multiple working hypotheses. Not only does such a method yield results faster, but it also increases the chance that the results are correct, which is a problem for research designed to identify positive correlations between variables.

Studies should be designed with clearly defined and explicitly stated multiple hypotheses. The data required to falsify these hypotheses should be determined before the experiment is designed to direct data collection. This procedure will prevent the waste of both money and time in performing unsuccessful pilot studies. Each study should include a control and multiple treatment groups with specimens randomized into each group. Large sample sizes should be used, usually defined as greater than ~30, for each treatment since such large samples improve test resolution and power. Studies should be run for long periods, observing decay processes from death to bone weathering and breakdown. In addition replicates of each experiment should be performed to better constrain the variability within and between treatments and trials. Experiment samples should all have the same known history and future studies should utilize the same specimen histories and data collection techniques. This procedure would enable direct comparison between data collected in multiple experiments conducted by different investigators since the same protocols were followed. Analytically statistics should be used to quantify the variability and differences between treatments. Each investigator should learn which statistical tools are appropriate for each data set, and how to correctly apply them.

Lastly, previous research, including the initial “classic” studies, should be repeated and their conclusions tested. A fundamental tenant of science is the replication of research by other groups. Too frequently previous research is accepted uncritically, leading to further studies based on false conclusions since the original research was not subjected to falsification.

If these general guidelines are followed there will be a general increase in taphonomic information gathered for a lower cost and over a shorter time. Collaboration will improve experimental design, data analysis, and applications to the historical problems faced by each investigator. This will result in the field of taphonomy moving forward at a faster rate and improve the scientific quality of the research performed.

Taphonomy, Experiment, Design

D3 The New Adversarial System in Colombia: Difficulties and Challenges

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After attending this presentation, attendees will understand the current situation of the new adversarial system in Colombia and also its social, cultural, forensic, and legal impact during the last five years.

This presentation will impact the forensic science community by showing how the defense lawyer is at an enormous disadvantage in relation with the prosecutor, especially in the quality and facilities for forensic analysis and criminal investigation.

For almost 100 years, the Colombia criminal system was an inquisitive one. For this reason more than 80% of criminal lawyers were trained to undertake cases for the defense using all the legal tools of this system. At the same time, criminal investigators and forensic scientists working for the General Attorney Office have been the only ones able to assist cases in a legal context, getting training and experience. On January 1, 2005, Colombia changed its criminal system implementing an adversarial type system. From this moment the defense lawyers had been in a disadvantage in relation to the prosecution due to several reasons, especially training in the new system, independent forensic support, and limitations in criminal investigation among others. On the other hand, especially due to international support, the General Attorney's Office and its forensic scientists and criminal investigators are getting better facilities and training.

Three cases will show how this situation has caused a troubling social situation in Colombia because most defense lawyers are not giving correct advise to their clients and for that reason, defendants are accepting guilty charges before a trial, even if they are innocent. In this way, defense attorneys avoid the preparation of the case for the trial.

Adversarial System, Criminal Investigation, Defense Investigation

D4 Studying the Effects of Plastic Storage Systems on DNA Degradation of Blood Evidence

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After attending this presentation, attendees will have a greater understanding of the effects of storing blood evidence in plastic containers as opposed to the conventional paper bags.

This presentation will impact the forensic science community by serving as enlightenment to alternative storage methods for blood evidence that is collected from a crime scene. The goal is to avoid evidence contamination by increasing organization abilities and reduce the effects of damp storage conditions or flooding.

This research challenges the conventional wisdom that blood evidence should only be stored in paper bags. By expanding the knowledge of the effects of various storage systems on the rate of DNA degradation from blood evidence collected from a crime scene, it will be possible to create alternative storage opportunities for evidence, especially for archival purposes. This has been of concern because evidence stored in paper bags and cardboard boxes have been susceptible to extreme condition changes such as an evidence storage locker flooding or being stored in a freezer. The same properties that allow for moisture to escape, also allow moisture to enter and contaminate the evidence. However, plastic containers are known for trapping moisture as well as repelling it. By learning more about the degradation of evidence stored in plastic containers, future catastrophes

could be avoided by storing blood evidence in airtight and waterproof plastic containers. The hypothesis being tested is that if blood evidence is allowed to dry before being stored, there will be lower or equal degradation rates observed in samples stored in plastic containers compared to those stored in conventional paper bags. Moreover, if plastic containers can be employed as a storage system, it would provide for better organization and cataloging of evidence that could minimize the unnecessary handling of evidence and possible contamination.

The hypothesis is tested by establishing various experimental conditions that are prepared in triplicate and vary in the type of container used and the interval of time that the evidence is stored. Samples are prepared from fresh blood used to stain swatches of t-shirt material in order to replicate actual evidence collection conditions. The controls consist of closed and open paper bags, which respectively represent the current method of evidence collection and evidence that is not stored, but isolated. The time variables being employed were 1 day, 1 week, 2 weeks, 1 month, 2 months, and 3 months. Varying types of commercially available plastic bags and containers as well as plastic evidence bags are used for the container variables. The samples are collected and stored for their assigned lengths of time before organic DNA extractions are performed on the samples. In order to measure the results in a quantitative manner, DNA degradation is measured through the allelic dropout rate observed after amplification using Promega's Powerplex® 16, a NIST approved set of human STR primers. Allelic dropout can be related to DNA degradation because as DNA degrades, it will break randomly throughout the strand, occasionally causing breaks in a sequence that is supposed to be amplified. This occurs first in the longer strands and progressively into the smaller strands as the DNA becomes more degraded. Thus, allelic dropout will begin in the longer sequences and can be measured as it becomes more prominent throughout the DNA profile. This allows for the quantification of the number of samples affected and the degree of degradation observed thus the rate of allelic dropout will be used to test the hypothesis to a 95% statistically significant level.

Plastic, Storage, Blood

D5 A Quantifying Study of VOCs Released During Early Decomposition Using SPME and GC/MS and the Relationship to the Interval Since Death

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After attending this presentation, attendees will develop a better understanding of the human decomposition process and the analytical techniques used to analyze the volatile organic compounds emitted. Attendees will also learn that the gases released can provide forensic scientists with information on the interval since death as a alternative to cadaver dogs.

This presentation will impact the forensic science community by providing an insight on the chemical composition of the volatile organic compounds humans release during decomposition. It will also provide clues about the impact that the environment has on the decomposition process and the VOCs released. Furthering this study, will benefit the forensic science community by establishing a new method for detecting and quantifying VOCs which can ultimately assist in victim recovery such as in mass graves and clandestine burial sites.

The basis for human decomposition has been studied and researched thoroughly for a long time. Decomposition refers to the reduction of the body of a formerly living organism into simpler forms of matter. The process of decomposition can be divided into two

categories. Phase one is where the production of vapors occur. In the second phase, liquid materials form and the flesh matter begins to decompose. The progression of decomposition in a living organism occurs in four stages: fresh, bloat, decay, and dry. Fresh is the stage of decomposition that occurs in the first few days following death. During this stage of decomposition, the body enters algor mortis, which is where the body cools to a temperature consistent with its surroundings. When the body reaches the final stage of autolysis, an anaerobic (without air) environment is created. When this environment is generated, it allows the normal bacteria to breakdown the remaining carbohydrates, proteins, and lipids in the body. The products of the breakdown then create acids, gases, and other products which then produce volatile organic compounds (VOC). The putrefaction stage is where odor, color change, and bloating of the body occur. The bacteria activity occurring in the cecum, area near the small intestine, causes the lower abdomen to turn green which is a result from the breakdown of the hemoglobin into sulfohemoglobin ultimately causing the green color change. The formation of gases enters the abdomen which forces liquid and feces out of the body. The bacterium formed in this stage enters the venous system therefore causing the blood to hemolyze. Once the putrefaction process concludes, the body enters the black putrefaction stage. During this stage the body cavity ruptures, the abdominal gases escape, and the body darkens from its greenish color. This stage ends when the bones of the corpse become evident, which can take anywhere from 10-20 days after death. The conclusion of this stage is dependent on the temperature and region where the body is located. The Butyric fermentation stage is where mummification of the body starts to take place. During this stage the body starts to dry out and then goes through adipocere formation. The final stage of human decomposition is dry decay. There are a number of factors that affect the rate and manner of decomposition such as temperature, humidity, rainfall, and bug activity.

Human decomposition is a very complex process and has not been well studied at the chemical level. Many studies have been done to measure the accumulation of volatile organic compounds (VOC) that are produced during the early stages of human decomposition. Studying the development of VOCs over a certain period of time using pig (*Porcus*) carcasses as an alternative to human bodies could possibly provide important results about the unknown chemical composition of death. The VOCs will be collected using solid phase microextraction (SPME) fibers. Once the compounds are collected, they will be quantified and identified using gas chromatography/mass spectrometry (GC/MS). The data will be used to determine if there is a correlation between the compounds present and the interval since death. The results will also be studied to determine whether or not the environmental conditions have an impact on the formation and distribution of the VOCs from the body during the decomposition process. Four different scenarios will be established to measure the VOCs released during the early decomposition of a pig. According to current literature publications, the VOCs that release during this process occur most often within 0-3 days after death. The pig carcasses will be monitored at varying time intervals ranging from hours to days. Each scenario will take into account different environmental factors such as humidity, temperature, and rainfall which could possibly affect the decomposition process of the pig and ultimately the release of VOCs.

Human Decomposition, Volatile Organic Compounds, Interval Since Death

D6 The Influence of Experience on Utilized Coefficient of Friction While Walking in High-Heeled Shoes

Mark G. Blanchette, MS, 352 Myrtle Street, #6, Glendale, CA 91203*

After attending this presentation, attendees will have been introduced to the preliminary findings of a research study investigating how an individual's experience wearing high heel shoes influences the utilized coefficient of friction (uCOF) during walking. After attending, attendees will understand the basic theory of why slips occur, how heel height affects uCOF, and whether one's experience wearing high-heeled shoes plays a role in contributing to increased slip risk.

This presentation will impact the forensic science community by sharing the beneficial knowledge obtained from this presentation to forensic scientists/engineers who study the scientific and/or practical aspects of slip and fall events.

Slips occur when the utilized friction (uCOF) of an individual exceeds the available friction provided by the shoe/floor interface.¹ uCOF can be influenced by a number of factors including walking speed, age, the presence of a disability, shoe hardness, and shoe design.^{2,3} With respect to shoe design, we recently have reported that the friction demand during walking increases as a function of heel height.⁴ More specifically, we reported that the uCOF while wearing high heels (9.5 cm) was significantly higher than when wearing shoes with low (1.3 cm) and medium heel heights (6.4 cm). Although uCOF increases with heel height, it is not known how experience affects uCOF during walking. It is conceivable that women who do not have extensive experience walking in high heels may ambulate in a way that increases uCOF and therefore slip risk. The purpose of this study was to determine whether the level of experience wearing high heeled shoes affects uCOF during walking.

To date, six healthy women have been recruited for this study. Based on a survey describing their experience wearing high heeled shoes, three subjects were classified as "experienced" (experience rating of 8 or higher on a 10 point scale) and three were classified as novice (experience rating of 3 or lower on a 10 point scale). The two groups were similar in terms of age (28.0 ± 4.4 vs. 26.0 ± 5.3 yrs), height (159.3 ± 7.5 vs. 166.0 ± 6.6 cm), and weight (53.7 ± 12.6 vs. 64.4 ± 16.1 kg). Subjects walked at self-selected velocity under 2 different shoe conditions that varied in heel height (low: 1.27 cm and high: 9.53 cm). Each subject was provided with footwear in their respective size. Both shoes had the same manufacturer and were chosen for their similarities in design, construction materials, and quality. Ground reaction forces were recorded using a force platform at 1560 Hz. Utilized friction was calculated as the ratio of resultant shear force to vertical force. For each trial, subjects' peak uCOF was determined during the first 50% of the stance phase.

Subjects in both groups walked at similar velocities for both shoe conditions. For all subjects, utilized friction increased for both groups as heel height increased. However, the change in uCOF across shoe conditions in the novice group (0.23 to 0.35) was more pronounced than the experienced group (0.22 to 0.29). The higher uCOF in the novice group during the high heel trials was the combined result of a 14% decrease in the vertical ground reaction force and a 30% increase in the resultant shear force when compared to the experienced group.

Consistent with the previous study,⁴ results indicate the friction demand during walking increases as a function of heel height. When wearing high heels, novice subject demonstrated a 51% increase in uCOF compared to the low heel condition. This was in contrast to the 31% increase in uCOF observed in the experienced group. These results signify the need for individuals to be properly acquainted with high-heeled shoes in order to minimize the risk of slips and falls.

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Slips, High Heels, Utilized Friction

D7 Was It an Accident That He Shot His Wife With a Gun?

Carrie Costello, BA, and J. Steve Kohne, 2408 Temple Court, West, West Lafayette, IN 47906*

After attending this presentation, attendees will understand the principles of crime scene reconstruction and the use of firearms training and pattern injuries in investigating a death scene.

This presentation will impact the forensic science community by demonstrating the real world implementation of the knowledge gained through hours of lectures and training in crime scene reconstruction and the use of firearms training and pattern injuries in investigating a death scene.

During this presentation, a case study will be presented of an actual investigation that was initially reported as an accidental shooting. Through the evaluations of statements, observation at the death scene, examination of pattern injuries, and radiological testing, the investigation took a sharp turn. This was no longer being investigated as an accidental shooting.

Using trajectory, mathematics, bloodstain pattern analysis, pattern injuries, and gunshot pattern analysis, the crime scene was physically reconstructed. This was all due to refute the statement of the suspect that he tripped, while walking down a dark hallway, causing him to shoot the victim.

The investigation started on January 24, 2001 when the Tippecanoe County Sheriff's Department was advised of a shooting that had occurred in the south/east part of the county. When officers arrived at the scene, they found a 20-year-old female lying on the basement bedroom floor. The female had a gunshot wound to her lower left abdominal area. She was transported to an area hospital and pronounced dead on arrival.

While investigating the shooting scene, the husband of the victim was explaining to the officers what had occurred. He told officers that he had been hunting earlier in the evening and had brought the shotgun into the residence where he and the victim, his girlfriend, lived with his parents. The husband had stated that he and the victim had drunk some beer and had retired to bed. After having intercourse, the male states that he got up to use the bathroom. Upon returning from the bathroom, the male tells deputies that he remembered the shotgun that he had brought into the house and wanted to put it up. He said he retrieved the weapon and was walking through the darkened living area towards the bedroom when he tripped over a small stool. He told the deputies that when he fell to the floor the shotgun struck the floor with the butt of the shotgun and discharged. He then heard his wife moaning and turned on the lights. He found that she had been shot in the stomach by the shotgun.

An examination at the hospital was requested in order to look for any evidence on the body that might help the investigation. The female

victim's body was still in the trauma room. Her injuries were still bandaged and upon removing these to examine the wound, it was noticed that the intestines had eviscerated. An x-ray of the victim was taken and it was found that the pellets from the shotgun had gone down into her pelvic area and not up into her chest. This directionality of the pellets reinforced this shooting did not occur as relayed by the husband.

After an autopsy was performed, it was noted that the gunshot wound was 35½ inches from the bottom of the wife's heel. There was also no stippling pattern which indicated that the shotgun blast was from 3-6 feet away from the victim. The approximate angle of entry of the shot pattern was 27 degrees.

Using this information, a number of forensic disciplines were utilized to come to the conclusion that the husband had intentionally shot his wife. The reconstruction will be discussed and the attendee will be able to observe how this conclusion was attained.

Homicide, Accidental Shooting, Crime Scene

D8 Rodent Gnawing, Wildfire, and Cultural Modification: Using Forensic Techniques to Interpret Historic Artifacts From the Spencer Site

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The goal of this presentation is to provide an example of how modern forensic techniques contribute to the field of historic archeology.

This presentation will impact the forensic science community by highlighting a case where knowledge relevant to both fields assisted with the interpretation of a historic site. The presentation will hopefully encourage communication between forensic experts and archeologists; ideally, this would optimize the insights of professionals in the interpretation of sites and cases through reciprocal knowledge, therefore benefiting all parties.

The Spencer Site is a historic site in the Seeley Lake area of Western Montana that contains a wealth of information within only a few artifacts. The site was revealed to archeologists in the fall of 2007 after a large wildfire swept through the area, which severely burned the vegetation and exposed the ground surface. The Spencer site lies within a travel corridor proximal to the Old Jocko Indian Trail and dates to the late Bison fur trade period, around the late 1870s. Spencer .56-52 cartridges were the dominant artifact at the site, and a cluster of other high value artifacts were found amidst the dispersed cartridges. The cluster of artifacts included a bullet mould, a pair of scissors, a cut nail, components of a possible beaver trap, an axe head, and a Bison hide scraper crafted from an octagonal rifle barrel. The artifacts were analyzed and curated in the Heritage department at the Lolo National Forest Supervisors Office. Each artifact was analyzed individually as well as macroscopically to determine the effects different environmental and cultural processes had on the artifacts over time. Some of the artifacts that were found in the cluster at the base of a stump exhibit unique characteristics that were produced through cultural means, including odd striations on the axe head, strange use patterns on the scissors and bullet mould and hammer marks on the Bison hide scraper. The Spencer cartridges were malformed from a variety of cultural and environmental influences. Rodent gnawing marks of various degrees occur on the bullets; some of the bullets have been extensively gnawed, while others show no gnaw marks. The bullets also show various degrees of melting and oxidation that would have taken place prior to the Jocko Fire of 2007. Several unique metal pieces were analyzed using a SEM with EDX to determine their elemental makeup, and the results provided key insights into the events surrounding the deposition of the site materials. The artifacts and the cultural modifications as well as the

environmental processes that affected them have interesting implications to the overall interpretation of the site and how the site fits into the historical context of Montana during this fascinating period of history. These artifacts reinforce the possibility that Native American artifact assemblages during this time period look strikingly similar to Euro-American assemblages due to the extent of assimilation. Though the artifacts at the site provide insight for the events that happened at the site, the evidence was not conclusive enough to determine which cultural group the artifact assemblage should be associated with.

Spencer Cartridges, Rodent Gnawing, Historic Archeology

D9 Field Capability of Dogs Trained to Locate Individual Human Teeth

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After attending this presentation, attendees will have a basic familiarization with the use of human remains detection dogs and will specifically learn what to expect from a team capable of locating teeth in support of forensic investigation. In addition, the attendees will gain an understanding of the relevance of utilizing dogs trained specifically for locating a particular target, such as human teeth, rather than a generalized "search dog."

This presentation will impact the forensic science community by expanding knowledge about the capability of dog teams trained for human remains detection focused on human teeth. A second impact will include demonstrating the educational value for investigators on how to approach requests for this specialized but highly useful resource.

Avulsed teeth can be difficult if not impossible to recover in the outdoor environment, yet are important for victim identification. Dogs have an advantage as a tool to locate teeth in that they rely primarily on olfactory rather than visual cues and their olfactory sense exceeds man-made equipment. However, not all search dogs teams are trained for human remains detection, and within that specialized detection discipline not all teams are prepared for, or necessarily capable of, precision detection in support of forensic evidence collection. Teams that are capable of working this type of assignment can be an efficient and valuable means for locating evidence during an investigation. Furthermore the use of such dog teams may reduce costs, minimize scene disturbance, and/or expedite data collection.

Results are presented from a study which had two objectives, (1) quantify the capability of dog teams at locating individual human teeth in the field setting; and, (2) quantify the role of human remains detection training relative to field performance. The field capability trials were conducted using a double-blind research design. Each of three dog teams searched two separate (10m)² plots containing ten teeth each. Dog teams worked between 27 and 50 minutes in each plot. Study results demonstrated that dog teams can locate individual human teeth in the field environment, with a recovery capability to 79 percent, but not all teams were equally capable.

Training data were analyzed for the seventy-eight days immediately preceding the trials. Dog team capability in the field trials correlated with capability in training. The best predictor of capability during the trials was the cumulative recovery rate for the team's last training prior to participation in the trials. This is important because "recovery" during training equals the probability of detection (POD), and POD is variable based on numerous factors one of which is the sensitivity, strengths, and limitations of the detection tool. Based on the results from this study, capability in training predicts the POD of a team during an actual deployment, which directly relates to evidence recovery.

Overall, results showed that human remains detection dog teams can be an effective and efficient tool for locating individual human teeth in the field setting. Individual team qualifications are important when selecting teams to search for individual human teeth and training specifically for this task is critical. It is common in human remains detection dog training to expose the dogs to as many different sources as reasonable to help expand their scent picture as to what constitutes human remains. Nevertheless, the challenge of finding such small and limited scent sources as single human teeth should not be underestimated. While this study demonstrated that dogs are capable of finding single human teeth in a field setting, it also showed the variability in capability in dog/handler teams. Much of this could be connected with both the type and amount of training the teams did prior to the field trials. Working blind problems, where both the number and location of sources are unknown to the handler, is an important means to develop the skills of the team to find target sources in a search environment. Finally, a team's recovery rate in training, calculated on success during blind problems, is a good predictor of POD on actual search deployments.

Evidence Collection, Odontology, Forensic Investigation

D10 Problematic and Perspectives of Child Abuse Investigation in Colombia

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After attending this presentation, attendees will become familiar with child abuse legal problems in Colombia and will learn some suggestions for the criminal investigation of these cases.

This presentation will impact the forensic science community by exhibiting the difficult current situation about legal classification of some behaviors related with child abuse in Colombia and the introduction of useful research directives in certain cases of maltreatment.

Child abuse is defined as a series of deliberated actions and/or omissions that are carried out by parents, relatives, caretakers, or other children, that result in physical or emotional damages, or the imminent risk of serious damage or death. Nevertheless, within the Colombian penal code, child abuse phenomenon is not clearly defined. It is determined according to the characteristics of each case as well as the public prosecutor criteria, that a crime can be typified as a personal injury, abortion, kidnapping, torture, human trafficking, sexual assault, sexual abuse, nutritional nonattendance, incest, or domestic violence, among others, being this last one the most frequently used to process the case. An example of this situation is the statistical results released by the National Institute of Legal Medicine and Forensic Sciences, which in 2008 completed 13,523 medical examinations by physical injuries within the domestic violence context, 16,120 sexual examinations, and 882 autopsies in cases of homicide, but this information does not emphasize the conditions under the facts took place or the specific kind of child abuse.

Although there are some guides and protocols regarding forensic medical examination on physical injuries and sexual violence, both in adults and children, there is not a manual to guide in the criminal investigation of child abuse cases. The investigation is restricted to fulfillment of routine activities which do not provide an integral understanding of the phenomenon and less to undertake the right judicial decision and to achieve an effective children protection.

Doing a review to the current situation of these cases and analyzing child abuse typology, widely described in scientific and forensic literature, certain directives and checklists within the criminal investigation are suggested in order to make emphasis in an

interdisciplinary work and approach on the victim (family and social structure, socioeconomic context, medical background, stage of development, scholastic performance, etc.), the aggressor (maltreatment antecedents, drug abuse, labor situation, mental condition, educative level, relationships, criminal antecedent, etc.), the crime scene (characteristic of the place, suitable inspection, compilation of evidences, versions given by the victim and the aggressor correspondence, etc.), and other alternative sources of information (documents, professors, neighbors, relatives, civil servants of social services, medical personnel, etc.), applicable in cases of physical abuse, Münchhausen by proxy syndrome, shaken baby syndrome, negligence, psychological maltreatment, institutional abuse, sexual violence and homicide of children.

Child Abuse, Criminal Investigation, Check List

D11 Cognitive Contamination in Medicolegal Death Investigations

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After attending this presentation, attendees will recognize the affects of biases and heuristics in medicolegal death investigations.

This presentation will impact the forensic science community by providing awareness of the internal and external factors that influence medicolegal death investigations and providing techniques to mitigate those destructive influences.

Independence and objectivity are the most important values in medicolegal death investigations. Preliminary information provided by law enforcement officials, witnesses, and family members can affect an investigator's observations. These external sources in conjunction with internal processing of information can mislead or damage an investigation. Internal processing includes "heuristic thinking" which are simple mental shortcuts ("rules of thumb") used to comprehend a large amount of information in an efficient (quick and dirty) manner.

All forensic investigations, especially medicolegal death investigations, are influenced by conformity effects, confirmatory biases, and availability and representative heuristics. In order to maintain independence and objectivity, an investigator must not only have awareness of biases and heuristics, but institute investigative techniques to mitigate these influences. A case example will be used to illustrate how biases and heuristics affect medicolegal death scene investigations.

Medicolegal Death Investigations, Cognitive Contamination, Bias

D12 A Forensic Investigation of an Epidemic of Blindness

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The goal of this presentation is to review the details of the blinding worldwide *Fusarium keratitis* epidemic of 2004-2006 and present laboratory proof that defective plastic bottles and improper temperature control resulted in fungistatic failure of the contact lens solution.

This presentation will impact the forensic science community by discussing why the previous theory to explain the *Fusarium keratitis* epidemic of 2004-2006 was based on a false premise; namely, that the components of the contact lens solution itself interacted in such a way that *Fusarium* growth was facilitated. If this were correct, then cases of *Fusarium keratitis* should have been traced to all four worldwide factories where the solution had been manufactured. In fact, the cases

could be traced to only one factory, in Greenville, South Carolina. The attendees will learn the details of the epidemic and the laboratory investigation which showed that defective plastic bottles and improper temperature control resulted in fungistatic failure. The attendees should learn not to accept superficial answers to difficult questions. As the Nobel Laureate Albert Szent-Gyorgyi said: "Research is to see what everybody has seen and think what nobody has thought."

Background: In August 2004, Bausch & Lomb (B&L) introduced a new contact lens solution, ReNu with MoistureLoc (ReNuML), containing the antimicrobial agent alexidine; an agent not found in other contact lens solutions. In July 2005, an increased incidence of *Fusarium keratitis* was noted in Hong Kong and in February 2006, the first 35 of 62 cases of ReNu-related *Fusarium keratitis* were reported from the Republic of Singapore. In early March 2006, the first U.S. reports of ReNu-related *Fusarium keratitis* were reported to both the Food and Drug Administration (FDA) and the Centers for Disease Control and Prevention (CDC) from Newark, New Jersey and (by JDB) Dayton, Ohio. A total of 154 confirmed cases were ultimately identified in the U.S. outbreak and the use of ReNuML was significantly associated with having *Fusarium keratitis* (adjusted odds ratio, 22.3). In mid-May 2006, the product was finally withdrawn from the world market. At the termination of the epidemic, hundreds of cases of *Fusarium keratitis* had occurred worldwide with many resulting in permanent blindness. Numerous researchers have since attempted to explain the etiology of this epidemic. B&L investigators acknowledged that all of the cases were related to the ReNuML solution produced only in their Greenville, South Carolina plant (as opposed to the other manufacturing sites in Italy, China, and India). The CDC found no fungal contamination of unopened bottles produced by that plant (including bottles with the same lot numbers as those that were used by affected patients) and noted multilocus genotyping of clinical isolates from affected patients, essentially excluding the possibility of a single-point source contamination of the solution itself. They concluded that this epidemic was due to a failure of ReNuML to disinfect adequately after point-of-use contamination rather than from intrinsic contamination with *Fusarium*. Factors hypothesized to have contributed to this epidemic include direct uptake of alexidine by contact lenses, reduced antimicrobial activity of evaporated ReNuML, enhanced growth of *Fusarium* on ReNuML biofilms on contact lens cases, direct penetration of *Fusarium* into soft contact lenses, and patient noncompliance. However, none of these factors, either alone or in combination, would explain why only the ReNuML produced in South Carolina had been implicated. A recently published study (Bullock et al, *Arch Ophthalmol* 2008;126[11]:1493-1498) reported that a May 2006 FDA inspection of B&L's Greenville, South Carolina manufacturing site affirmed that B&L had failed to regulate storage and transport temperatures of their products, even though the label on the bottle clearly stated: "Store at room temperature." Historic climatological and other data revealed that the solution, when stored and transported without temperature controls, could have been exposed to temperatures as high as 75°C (167°F). Six different contact lens solutions were then studied for temperature stability. Two bottles of each solution were separately stored at room temperature and 60°C (140°F) for 4 weeks, serially diluted, and then tested for their ability to inhibit growth in two different fungal media of 11 *Fusarium* isolates (7 of which were associated with the *Fusarium keratitis* epidemic). ReNuML demonstrated the greatest decline in efficacy after 60°C storage. Regarding the *Fusarium keratitis* epidemic isolates only, the ReNu with MoistureLoc bottle stored at room temperature allowed growth in 27 of 84 combinations vs. 67 of 84 combinations with the 60°C-stored bottle ($P < 0.0001$). Thus, when exposed to prolonged temperature elevation, ReNuML lost its *in vitro* fungistatic activity to a much greater extent than other commercial products. That study concluded that improper temperature control of ReNuML may have contributed to the *Fusarium keratitis* epidemic of 2004-2006. Bullock et al also demonstrated that boiling

(~100°C/212°F) the solution for ten minutes in a glass tube did not degrade its fungistatic capability, suggesting that the plastic container, in combination with prolonged heat exposure, could have been the cause of the observed fungistatic failure.

Purpose: To demonstrate the effects of container properties and storage temperatures on the ability of the ReNuML contact lens solution, previously implicated in the *Fusarium keratitis* epidemic of 2004-2006, to inhibit growth of *Fusarium* species.

Methods: The solution was divided into six aliquots and stored separately for four weeks at room temperature (RT), 42°C (108°F), and 60°C, in both their original plastic bottles and similarly-sized glass containers, then tested in triplicate for their ability to inhibit the growth of seven *Fusarium* isolates previously associated with the *Fusarium keratitis* epidemic of 2004-2006.

Results: When stored in glass containers, the solution demonstrated no fungistatic deterioration at all three temperature levels. However, when the solution was stored in its original plastic container at 60°C, a highly statistically significant fungistatic deterioration of the solution was noted compared to those stored in plastic at either RT ($P = 4.0 \times 10^{-7}$), 42°C ($P = 2.10 \times 10^{-6}$), or in a glass container at 60°C ($P = 1.29 \times 10^{-6}$).

Conclusions: When stored in its original plastic (as opposed to a glass) container and exposed to prolonged temperature elevation (60°C for four weeks), the contact lens solution implicated in the *Fusarium keratitis* epidemic of 2004-2006 loses its *in vitro* fungistatic capability. The temperature required for fungistatic failure is $>42^\circ\text{C}$ and $\leq 60^\circ\text{C}$. Thus, a lengthy and highly detailed forensic investigation revealed that this epidemic was associated with a combination of defective plastic bottles and improper storage temperatures. In the interest of preventing future epidemics, since the exact type of plastic containers used at each of the various manufacturing sites is presently undivulged, this information should be revealed.

Blindness, Epidemic, Fusarium

D13 Ancient DNA Analysis of Dried Coral Samples: An Accurate DNA-Based Identification of Threatened Species for Support of Wildlife Trade Law Enforcement

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The goal of this presentation is to introduce attendees to a new ancient DNA-based approach to extract DNA from dried and/or processed coral samples. Attendees will also gain an understanding of how this technique will benefit wildlife trade law enforcement, through the accurate identification of threatened and endangered coral species.

This presentation will impact the forensic science community by providing a reliable, sensitive, DNA-based protocol for the rapid identification of protected coral species, and provide law enforcement with an effective method of detecting illegally traded specimens of protected coral species. This technique will contribute to the long-term protection of coral reefs, which has wide implications for marine ecosystems, environmental conservation, and sustainable trade.

Despite being listed as protected taxa under CITES, every year over one million corals are illegally harvested and shipped worldwide for the use in jewelry, art, and for the purpose of collection. For example, red coral (*Corallium rubrum*)-or precious coral- has been highly valuable as a gemstone for millennia. Illegal coral harvesting (in addition to the effects of global warming) has significant harmful impact on the marine ecosystem. Stony coral colonies are an essential part of highly diverse marine reefs, providing the basis for food and shelter of other marine wildlife. Research has shown that the slow growth rate of some species leads to colonies with ages of up to thousand years old.

To ensure the survival of these coral species and subsequently of the fragile marine ecosystem, law enforcement personnel must be able to discriminate between material manufactured from protected species, those made from unregulated species, and imitations made from legal materials to uphold international agreements such as CITES and national laws for wildlife conservation. However, these efforts are handicapped by the lack of reliable and accurate methods for species identification. The currently common visual identification of protected coral species is hampered by corals' diverse morphology, the modification of the coral into beads and other jewelry, and the excellent quality of some imitation material.

Although DNA-based species identifications have been applied to fresh coral specimens, the feasibility of extracting DNA from museum specimens or modified specimens found in jewelry and arts has not been tested. The goals of this pilot study were to test the feasibility of extracting DNA from modified or dried red coral samples and to obtain an accurate DNA-based species identification. Ancient DNA extraction protocols and strategies used here are highly sensitive techniques originally designed to maximize the amount of DNA recovered from severely degraded materials. The coral samples used in this study were obtained from the TRAFFIC repository in Vancouver, Canada. Coral samples were prepared and extracted using a modified ancient DNA extraction protocol (Yang et al. 1998). To ensure a reliable DNA-based species identification, the study targeted short, conserved regions (including COI and 16S gene fragments) of the coral mitochondrial genome. In this study, red coral DNA was successfully extracted and amplified from less than 0.5g of coral specimen, and the obtained sequences matched available red coral (*Corallium rubrum*) reference sequences. This result demonstrates the feasibility of recovering DNA from dry coral samples and the high sensitivity of this method for species identification with minimal destruction of the source material.

Once optimized, this technique will prove to be a fast, reliable and sensible DNA-based method for wildlife law enforcement agencies to identify endangered and protected coral species during investigations of illegal trade of protected coral species.

Ancient DNA, Forensic Wildlife, CITES

D14 Location of Graves Through Soil Spectroscopy: Differentiating the Reflectance of Grave Soils From Common Fertilization Treatments

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After attending this presentation, attendees will have learned that common fertilization practices of soils minimally affect the spectral signatures of soils and that the spectral signatures of grave soils differ from non-grave soils and fertilized soils. This differentiation in the spectral signature of grave soils, soils treated with manure, bone meal, or compost indicate that it is possible to use the spectroscopy of soils to

identify locations of clandestine graves through aerial or satellite imagery with minimal confusion from common soil treatments.

This presentation will impact the forensic science community by increasing knowledge on how common fertilization practices affect the spectral signature of soil. A better knowledge about this matter indicates that it is possible with high confidence to determine the location of graves using hyperspectral data from aerial or potentially satellite imagery. Confusion between spectral signatures of treated soil (non grave soils mixed with manure, bone meal, or compost) and graves is minimal.

This research is part of ongoing multidisciplinary studies at the burial site of an African animal zoo (Parc Safari), near Montreal, Quebec, Canada. This site is an ideal ground to conduct research on the effects of cadaver decomposition on the soil properties. The site contains several graves with multiple animals that had been buried 6 to 50 years ago. For this particular aspect of the research a total of three different burial sites were examined: an African elephant buried six years ago, a comingled mass grave of unknown age containing the remains of several animals such as a zebra and a ram, and an unexcavated grave containing a large ungulate (similar to a buffalo) and potentially other remains and a reference area (non-grave site). Furthermore, treatments that are often found in association with fields (compost, manure, bone meal, blood meal) that may have effects on the reflectance properties of the soil similar to cadaveric decomposition were examined.

The objective was to determine if the reflectance of grave soils can be differentiated from soils that have been fertilized with manure, compost, bone meal, or blood meal. The manure used for this experiment was collected from the McGill University Farm and came from cattle that had been fed a mixed diet similar to what free range cattle would have. The organic bone meal and blood meal were purchased at a local gardening center and the two-year-old compost had been produced from grass cuttings. While spectroscopy of soils and soil properties is a well developed and studied field in the physical sciences, few studies have examined the effect of adding products such as manure or compost on soil reflectance. Virtually no studies have yet compared the reflectance of such treated soils to grave soils from the same site. It is important to be able to differentiate between the spectral signature of cadaveric decomposition in the soil and soil that has been fertilized or treated with additives such as compost and others in order to reduce the potential false positives when searching for clandestine graves from aerial or satellite imagery.

Soil samples were taken from the three aforementioned graves in addition to reference soil collected from an area of the cemetery containing no bodies. The reference soil was mixed in equal parts with each of the additives (manure, compost, bone meal, blood meal) and the reflectance from 400-1,000nm of each grave, pure treatment (e.g. pure bone meal), treatment mixed with reference soil and pure reference soil was measured with an Analytical Spectral Devices Handheld Spectrometer in a dark room under a high intensity halogen light source for illumination. Lighting and viewing geometries were kept constant for each measurement. The reflectance data was subsequently classified to allow for a quantitative assessment of spectral differences and also converted to spectral fingerprints to allow for a visual comparison.

The results indicate that not only does each of the treatments have very different spectral signatures from the reference soil, but when mixed with reference soil, the spectra are still from that of that of the reference soil. Furthermore, the spectral signatures of the treatments and the treated reference soil also differ markedly from the spectra of the three graves indicating that the likelihood for confusion between the spectra of graves and soils treated with common forms of fertilizations is minimal from hyperspectral data.

Spectroscopy, Clandestine Graves, Fertilization

D15 Tangled Corpses: Interpreting a Complex Mass Grave at the Parc Safari Cemetery

Colin Nielsen, MSc, Neha Gupta, MSc, Christopher J.H. Ames, MA, and Stephen Leacock Building, Room 718, 855 Sherbrooke Street West, Montreal, H3A 2T7, CANADA*

After attending this presentation, attendees will better understand the complexities of mass grave excavation, especially the necessary archaeological methodology for collecting, analyzing and interpreting disarticulated skeletal and non-skeletal remains, where no oral narrative of that burial event exists.

This presentation will impact the forensic science community by augmenting with traditional grave recovery tools, an interdisciplinary methodology, to assist mass grave investigation. That, in turn gives the community at large, an approach that can be applied in parts of the world where sensitive social relations exist as a result of human rights abuses.

Very often, investigations of human rights abuses have focused on the identification of individual and mass graves. Reconstruction of the burial event has taken a secondary position in those scenarios. Yet, using an interdisciplinary methodology, the scope of investigation can be widened by collecting important contextual information during grave identification and excavation.

A more thorough recovery and analysis of the collected contextual information offers scholars and human rights investigators greater understanding of the depositional context, and the stratigraphy related to the burial event. That information is augmented with an analysis of the recovered skeletal and non-skeletal remains.

On-going studies of a mass grave at a zoological park in Quebec, Canada will be presented as an example of that interdisciplinary methodology. The fall 2008 excavation recovered from the mass grave the disarticulated remains of up to four mammalian individuals, including a zebra, bighorn sheep, antelope, and water buffalo and a black garbage bag with the semi-decomposed remains of a flamingo. Found in close proximity to the mammalian remains, were garbage bags with semi-decomposed intestinal remains.

The spatial entanglement of the skeletal and non-skeletal remains suggested that the individuals were buried in a single burial event. The bodies were piled on top of each other, rather than arranged side-by-side in the grave. The disarticulated state of their remains led excavators to speculate that the animals were partially dismembered before burial. Laboratory examination and analysis of the skeletal remains confirmed the hypothesis when, cut marks were identified at two points: below the head, and on the lower thoracic vertebrae. No cutting implement was recovered in the excavation. Investigations to identify the implement that was used for dismemberment are continuing.

Close examination of the soil stratigraphy in the excavation unit indicated the northern edge of the grave cut. The remains were situated in the southwest of the grave. There are strong indications that more individuals will be recovered from that part of the grave. The material evidence of the buriers suggests that the dismembered bodies were likely transported in garbage bags to the burial site. Excavators recovered thick nylon ropes from the grave. The rope is seen in prevalence on the surface, and just below ground cover throughout the cemetery. That in turn has raised questions about how it was used by the buriers.

There exist no institutional records at Parc Safari for this mass grave, or for the cemetery grounds where excavations are taking place. This cemetery ground is no longer used by Parc Safari, and represents up to forty years of animal burials. Because there is limited or no memory about the mass grave of interest, or about burial practices in the past, excavators are relying on high-resolution collection and analysis for their reconstruction of the burial event.

Mass Graves, Excavation Methodology, Human Rights

D16 Insect Succession Model for Southeast Texas in Early Spring

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After attending this presentation, attendees will be briefed on the first controlled human decomposition study for the Piney Woods biogeoclimatic zone which incorporated Houston, TX.

This presentation will impact the forensic science community by creating the first insect succession model on humans in this area and provide a baseline for future studies.

A human corpse was allowed to decompose above ground at the Southeastern Texas Applied Forensic Science (STAFS) Center at the Center for Biological Field Studies (CBSF) at Sam Houston State University in early spring. Other studies on carrion and survey studies using liver and heart had been previously conducted in the area. This study; however, represents the first controlled observation of human decomposition for the Piney Woods biogeoclimatic zone, an expansive area of sub-tropical Texas that includes the metropolis of Houston. Insect succession was recorded three times daily for approximately three weeks to document thoroughly the insect activity. During decomposition, night time temperature lows frequently dropped below 10 °C while day time temperature highs were frequently above 18.3°C. Several brief but drenching rain showers occurred. Of particular interest is the rapid mummification of the remains and the suite of insects specific to this process. Data from this research will be presented.

Forensic Entomology, Corpse, Early Spring

D17 Seeing Is BeLeeding

Matthew Doyle, BSN, Harris County Medical Examiner's Office, 1885 Old Spanish Trail, Houston, TX 77054*

After attending this presentation, attendees will understand some investigative principles that are required when investigating deaths due to exsanguination from an AV fistula used for hemodialysis. The attendees will also gain awareness of the physiology underlying the disease processes of chronic renal failure, diabetes mellitus, hypertension, and coronary artery disease and will be able to apply this knowledge to their death investigations. Some of the treatments for these diseases will be discussed as they are contributing factors for exsanguination. The types of hemodialysis access sites will also be reviewed in relation to manner of death.

This presentation will impact the forensic science community by serving as an educational tool for death investigators and augmenting investigative practices currently in place in each attendee's locale. Better investigations being performed allows for more accurate statistics to be kept, possibly preventing some of these deaths in the future.

This project was designed to assist death investigators ascertain all the necessary information on deaths due to exsanguination from hemodialysis sites. This presentation will be useful as an introduction into these disease processes, highlighting the symptoms and contributing factors that can lead to exsanguination. The reasons behind the need for investigating psychiatric history will also be explored. Many times, it is assumed that exsanguination from the AV fistula is a known

complication of hemodialysis and the manner of death is either natural or accidental. No questions are asked about suicidal ideations. The initial investigation and interviews of family members in deaths caused by exsanguination from the AV fistulas in decedents with chronic renal failure may be the most important aspects of the case. The cause and mechanism of death are rarely questionable mainly due to the quantity and pattern of arterial blood spatter present. The investigator can rule out blunt or sharp force injuries as he/she performs his/her physical assessment of the decedent during the scene examination. The manner of death requires further scene investigation as well as communication with the family and friends.

Although most of these deaths can be ruled as natural deaths after a quality investigation is performed, some of the deaths may be ruled as accidents or suicides, depending on the circumstances. It is the job of the investigator to gather the pertinent information during the investigation. Therefore, the investigator is the key to classifying these deaths properly. Since 2003, Harris County Medical Examiner's Office (HCMEO) has investigated 29 cases of exsanguination from hemodialysis sites. One incident occurred at the decedent's dialysis facility while the remainder of the incidents occurred at the decedent's residence. Of these 29 cases, 21 were ruled as natural deaths, 4 were ruled as accidental deaths, 2 were ruled as suicides, and 2 were undetermined. Of the 29 cases, 18 were scenes while the remaining 11 were hospital deaths.

With an adequate investigation, jurisdiction of some of these cases can be released with only the questionable cases requiring the medical examiner/coroner to perform an autopsy. Of the 29 cases, jurisdiction was released by HCMEO in one of the cases for the primary care physician to sign the death certificate and that took place in January 2009. Autopsies were performed in 20 of the cases. With improved investigations, HCMEO has been able to perform more external examinations on these cases. So far, six of the eight total external examinations since 2003 have been performed in 2008 and 2009 (through June) with eight autopsies from 2008 to present (June).

Exsanguination, Hemodialysis, Death Investigation

D18 Current Status of the Scientific Working Group on Bloodstain Pattern Analysis (SWGSTAIN)

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After attending this presentation, attendees will have an understanding of the current objectives and purposes of the Scientific Working Group on Bloodstain Pattern Analysis (SWGSTAIN) as well as the potential impact the guidance documents produced by this working group will have on the discipline of bloodstain pattern analysis.

This presentation will impact the forensic science community by updating them on the work currently being completed by SWGSTAIN.

In 2002, the FBI Laboratory coordinated a meeting to explore the idea of a scientific working group related to bloodstain pattern analysis. A core group of sixteen recognized bloodstain pattern analysis experts affirmed the need for a scientific working group on bloodstain pattern analysis, SWGSTAIN. Currently, the membership of SWGSTAIN includes 29 recognized bloodstain pattern analysis experts who represent law enforcement agencies, laboratories, and private practitioners, in

North America, Europe, New Zealand, and Australia. In 2009, the Midwest Forensics Resource Center, assumed the leadership role of SWGSTAIN from the FBI Laboratory.

The mission of SWGSTAIN is to promote and enhance the development of quality bloodstain pattern analysis practices through the collaborative efforts of governmental forensic laboratories, law enforcement, private industry, and academia. Currently, the SWGSTAIN membership is split into five (5) standing committees: (1) Taxonomy and Terminology; (2) Training and Education; (3) Quality Assurance; (4) Legal; and (5) Research. Each of these sub-committees has been assigned and is working on specific tasks that are deemed necessary by the entire working group. During our bi-annual meetings each sub-committee presents status updates to the entire working group. Once a committee is nearing the completion of a guidance document, the document is then distributed amongst the entire group for comment. This often occurs multiple times prior to the documents being published for public comment. Documents are not released for public comment until the document is passed through the membership and then through the SWGSTAIN Executive Board.

Within this presentation, the role of each sub-committee will be discussed along with their respective published guidance documents. In this presentation specific attention will be given towards addressing the projects currently being undertaken by the SWGSTAIN Research sub-committee. SWGSTAIN recognizes the need for further research in bloodstain pattern analysis and is working towards addressing what areas in the discipline are in need of research. In addressing the areas in need of further research, the Research sub-committee with the assistance of the entire SWGSTAIN membership, has compiled an extensive bloodstain pattern analysis bibliography that is available on www.swgstain.org.

In addition, SWGSTAIN is working to be proactive towards current issues impacting the discipline. A public position statement regarding the National Academy of Sciences Report on Forensic Science was recently published. The work of SWGSTAIN is on-going and relies upon the input of bloodstain pattern analysis practitioners. The current documents that are available for public comment as well as the completed guidance documents can all be found on www.swgstain.org.

Bloodstain Pattern Analysis, SWGSTAIN, Bloodstain Research

D19 A Short Stab in the Back at Long Distance

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After attending this presentation, attendees will learn of the potential of computed tomography (CT) for not only the evaluation of the manner and extent of intentional sharp trauma in the living, but also influencing the deliberations of the judges of fact.

This presentation will impact the forensic science community by increasing the appreciation of the usefulness of sectional imaging in evaluating trauma in the living.

A young woman, 28-years-old, was injured in her home by her 29-year-old ex-boyfriend during a social visit including consensual sex. The mood of the moment was destroyed when the young woman, hereinafter called the "victim" received a telephone call from another man. This enraged her visitor, hereinafter called the "defendant" who began to punch and kick her. The battering moved to the kitchen where the defendant knocked the victim to the floor, stepped on her face, and stabbed her in the back with a steak knife from the kitchen counter. He then screamed that he could not believe that he had stabbed her, but hit her in the head twice more. The defendant's emotions swung from remorse that he'd stabbed her to rage over the phone call but within minutes the victim persuaded her attacker to drive her to a nearby urgent care facility. Upon arrival, she fled inside while the defendant fled in the victim's automobile.

The victim was seen to have a stab wound in the back and immediately was transferred to a hospital. In the emergency department she was found to have bruises and tenderness around the eyes, nose and mouth, stable vital signs, and a 1 cm transverse stab wound in the back just to the right of the midline.

The American College of Radiology Appropriateness Criteria, and most surgical literature, recommend CT examination for stab wounds in the back to determine the necessity for surgical exploration. This was done and showed retroperitoneal air bubbles in the paraspinous soft tissues and around the kidney and renal pedicle. Subsequently the wound was packed with ¼ inch gauze, she was observed for about 36 hours, and discharged home.

Approximately 24 hours after the stabbing, the defendant was arrested in an adjacent state while driving the victim's automobile. He was charged with: (1) attempted 1st degree homicide while armed as a repeater; (2) felony aggravated assault while armed as a repeater; and (3) felony bail-jumping as a habitual criminal. Sequential terms of imprisonment for these charges would amount to 107 years.

A court-appointed defense attorney asked for an evaluation of the knife wound and its significance as depicted on the CT. He had received differing reports from the local physicians, neither of which was wanted to give an "expert" opinion. The CT findings were reminiscent of an obsolete method for visualization of the kidney and/or adrenal gland before the advent of CT. The anatomy of the renal fossa is pertinent to that old method and to this contemporary care, and will be illustrated.

The victim's CT show a cutaneous defect at the site of the stab wound. As the CT slices progress cephalic, small air bubbles indicate the angulation of the blade, reaching the area of the kidney and its pedicle. There is no evidence of extravasation of blood or urine on this or for a delayed re-study. The renal vessels are intact. The tip of the knife (with a 4 inch blade) only penetrates 2.5-3 inches — a half-hearted stabbing in an area where the compressibility of soft tissue allows a blade to penetrate substantially deeper than its length.

Direct questioning and cross-examination at a juried trial brought out the opinion that the wound was relatively shallow compared to the weapon, and no vital organ or vessel was damaged. The tip of the knife blade obviously just nicked the renal fascia sufficiently to admit some air without damaging a capsular artery or the kidney *per se*. (Comments will describe the unusual, if not unique, problem of testimony and display of courtroom exhibits over a "crow-fly" distance of approximately 860 miles because the State Public Defender Office refused travel money.)

The jury, apparently influenced by the lack of significant harm done and by the defendant taking her to medical care immediately after the stabbing, decided that it was not the defendant's intent to kill her. They brought in a reduced verdict of first degree reckless endangerment and bail jumping which carries a 25 year maximum sentence with a maximum of 15 years in prison up front with 5 years supervision, and 5 years concurrent time for bail-jumping.

Forensic Science, Forensic Radiology, Intentional Stabbing

D20 The Bullet That Killed Confederate General Ben McCulloch? Firearm Identification and Analysis of a Civil War .58-Caliber Bullet

Douglas D. Scott, PhD, Nebraska Wesleyan University, 11101 South 98th Street, Lincoln, NE 68526*

After attending this presentation, attendees will understand employing modern firearm identification procedures and theory to historic situations providing an alternative validation process to the field of firearm and tool mark examination.

The presentation will impact the forensic science community by demonstrating the capability and validity of firearm and tool mark examination to very old cold case evidence, in this case an 1862 battle-related death.

A large impact-deformed lead bullet that is purportedly the bullet that killed Confederate General Benjamin McCulloch during the Civil War battle of Pea Ridge, Arkansas on March 7, 1862 was examined using modern firearm identification procedures to ascertain if the bullet type and condition are consistent with the family story of this being the fatal projectile. McCulloch was a prominent Texan who had been appointed a Confederate general officer to command Texas and Arkansas troops in 1861. He had been a Texas Ranger and was a veteran of the Mexican-American War of 1846-1848. McCulloch's daring came to an abrupt and fatal end in Oberson's field on August 7, 1862 at the Battle of Pea Ridge, Arkansas. The bullet purported to have been recovered from McCulloch's body is a .58-caliber hollow base Minié ball or bullet with three rings or canelures around the lower skirt. The purported McCulloch bullet is impressed with three broad shallow land and groove marks. The land and groove marks are consistent with the bullet having been fired from a Model 1855 or Model 1861 rifled musket or other firearms rifled according to U.S. Government specifications such as the altered M1841 "Mississippi" rifle. The hollow base exhibits a rough surface or stippling effect that is consistent with the bullet being fired from a blackpowder weapon. The bullet essentially mushroomed on impact, although the mushroom effect is asymmetrical. The impact deformation on the bullet head is consistent with it having struck and penetrated an object with no intervening hard elements. The deformation is consistent with a bullet that was spin stabilized, and at the time it struck the object was still traveling in trajectory at a velocity well above its terminal limits. The deformation is consistent with having penetrated tissue, but not striking any bony features. On one side of the bullet's impact deformed area a tool mark is evident. The area is slightly flattened and impressed with very fine crisscross striations. These crisscross tool marks are consistent in type with the gripping or inside surface of the jaws of a medical forceps tip of the type in common use in the mid-nineteenth century. The impact deformed bullet was fired in a rifled musket of .58-caliber that is consistent with the type of weapon known to have been issued to the men of Company B, 36th Illinois Infantry Regiment who are credited with killing General McCulloch on March 7, 1862. The impact deformations evident on the bullet are consistent with it having struck McCulloch in the breast, but passing between the ribs, encountering only soft tissue in its path. The tool marks present on one side of the bullet are consistent with the gripping surface of medical forceps of the type known to be part of Civil War era surgical kits. None of the observations are inconsistent with the oral history ascribed to the bullet's origin or that it was removed from General McCulloch's body.

Firearm, Bullet, Historic

D21 The Rosario Shooting Incident: A Complex Analysis and Reconstruction

Alexander Jason, BA, ANITE Group, PO Box 375, Pinole, CA 94564*

After attending this presentation, attendees will become familiar with techniques for performing shooting reconstruction and analysis.

This presentation will impact the forensic science community by teaching novel and advanced techniques and technology for shooting reconstruction and analysis.

An officer involved shooting occurred in which two NYPD police officers fatally shot two suspects. Firing three handguns, a total of 28 rounds were fired by the officers striking the two decedents 8 and 14 times, respectively. The shooting scene included many bullet defects in the floor beneath where the decedents were laying.

The primary issue: Were the two decedents shot while on the floor or while they were active. Secondary issues included the location of the two shooters; the movements of the decedents; and time involved in firing the 28 shots. The physical evidence included the location of entry and exit defects on the bodies, wound paths, shored entrance and exit wounds, the bullet defects on the clothing, and the presence or absence of gunshot residue and bullet residue on floor and clothing and the significance of this evidence.

This paper demonstrates the methodology involved in a multidisciplinary approach to the reconstruction and analysis of a shooting incident in which bullet impact damage, cartridge case locations, victim wound path evidence from the autopsy, experimental, and photographic analysis and other elements are all integrated into an overall analysis which can be used to make significant determinations. These facts can then be utilized to determine what could and could not have occurred and specifically, if the description of the two police officers is or is not consistent with the physical evidence. Although a shooting incident reconstruction always includes the forensic crime laboratory analysis of the physical evidence, an effective reconstruction requires an understanding of the capabilities and dynamic characteristics of firearms, projectiles, ejected cartridge cases, gunshot residue, and the dynamics associated with bullet penetration into and out of clothing. This case is an effective example of how all these items can be integrated into an analysis and reconstruction of a shooting incident.

Additional important components in the overall reconstruction include the analysis of layers of clothing, the alignment of bullet defects in the clothing; advanced photographic analysis to attempt to correlate the floor defects with the gunshot wounds on the bodies and to create overlays of clothing layers for analytical purposes and to be used as exhibits; experimental ballistic testing; chemical tests used to distinguish entry from exit; the use of 3D computer animation modeling for both analytical purposes and to be used as demonstrative exhibits. High speed video imaging of relevant ballistic phenomena and fabric dynamics were also utilized for analytical and demonstrative purposes. This paper will discuss the incident, the evidence, and specifically how the analysis and reconstruction was performed.

Shooting Reconstruction, Gunshot Analysis, 3D Modeling

D22 Shooting Dynamics: Elements of Time and Movement in Shooting Incidents

Alexander Jason, BA, ANITE Group, PO Box 375, Pinole, CA 94564*

After attending this presentation, attendees will have an understanding of the times involved in shooting a handgun and become familiar with some of the significant human performance factors associated with shooting.

This presentation will impact the forensic science community by providing baseline data on shooting performance and related dynamics.

In the analysis and reconstruction of shooting incidents, a key element is often the timing involved in shooting, reacting, and moving. These data can be significant because they may be helpful in defining significant elements. These elements can include: how much movement or distance a person could have achieved before or during the shot sequence. Other determinations can relate to perception, reaction, and response before and during the shooting.

Specific data on the ranges of typical, average, or expected rate of firing do not exist in the literature. Although there is much available data on the mechanical firing rates of automatic weapons, there is very little data on basic questions as "How fast could someone have shot," "How fast could the officer draw and fire?" "How could the person have been shot in the back?" or certainly, "Why were so many shots fired?"

This paper addresses these and other questions.

Primary Issues Examined:

1. Shooting performance baselines.
2. Time to draw a pistol from a holster and fire the first shot.
3. Time intervals between shots.
4. Time required to stop shooting.
5. Time required to move from standing erect to a prone/supine position

This paper discusses the human performance dynamics involved in shooting and it presents an analysis and of several experiments:

Time Required to Stop Shooting: Most people have experienced instances in which they decided to inhibit or stop an action but were unable to do so. Clicking a computer mouse just after you noted that the dialog window closed or tossing an object (like a pen or candy bar) at someone just after you noted that their head turned away and would not see it coming. You know you shouldn't do it, but you can't stop your action.

There are psycho-physiological mechanisms which limit the time in which a human action (motor program), once begun, can be stopped. This experiment was designed to test the perception and the stop reaction time of a group of police officers.

Shots Fired at a Falling Person: The falling movement – whether a rapid collapse or a crumple resulting from incapacitating wounds – cannot be distinguished from a deliberate tactical maneuver of someone who has decided to go to ground to avoid being shot or to assume a less exposed position while returning gunfire. Falling to the ground itself cannot be a reliable indicator that a threat is no longer active. Even a mortally wounded person can fall to the ground and fire one or more shots before becoming incapacitated and/or unconscious.

The goal of this experiment was to measure the amount of time required for a person to fall to the ground from a standing position and to determine the number of shots that could have reasonably been fired during that period.

Time to Draw & Fire, Shooting Speed: The goal of this experiment was to determine the minimum, maximum, and average time required for a group of police officers to draw their handgun from a holster and fire one shot.

Experienced & In-Experienced Shooters: The shooting speeds of experienced and in-experienced shooters were measured. The purpose being to establish performance rates which can be used as reference baselines.

Rates of Fire (Shooting Intervals): Historical and empirical data was used to establish the fastest shooting rates measured during highly skilled professional shooting events and by experienced shooters.

Shooting Reconstruction, Human Factors, Reaction Time

D23 An Interdisciplinary and Community Approach to the Identification of Clandestine Mass Graves: The McGill University - Parc Safari Project

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After attending this presentation, attendees will better understand how to structure a large mass grave identification project that is interdisciplinary and features a community participation component and collaborations with private enterprise.

This presentation will impact the forensic science community by making three main contributions with the help of scholars of a number of disciplines, of private enterprise partners, and of local community members, the project will develop, refine, and test methods for the location of mass graves. It increases knowledge of how mass graves modify a pre-existing built landscape, and it helps identify ways in which local traditions reflect the presence of graves. A non-negligible benefit of the project is that it shows how academics, private enterprise, and local community members can cooperate to each reach their own objectives and at the same time produce knowledge critical to addressing a serious human rights-related issue.

For the past year, archaeologists, remote sensors, geologists, wetland scientists, legal scholars, representatives from private enterprise and local community members have been collaborating to develop innovative ways of locating clandestine mass graves and identifying and solving the main challenges involved. In September 2007, the zoological director of an African animal park located near Montreal, Canada, contacted the Anthropology Department at McGill University to explore the possibility of recovering animal skeletons from the park's cemetery to create educational exhibits. The Parc has been in operation for nearly 40 years, but due to a recent change in ownership and administration, the cemetery is almost entirely undocumented. Even its spatial extent is currently uncertain. The land on which the cemetery stands no longer belongs to the park, but is owned by a local farming family.

The McGill Anthropology Department began using the cemetery as the location of its archaeological field methods course. Members of the Geography Department working on the question of clandestine mass graves in genocide and war crimes contexts soon added themselves to the team and started using the cemetery to test new methods for locating graves using a mix of remote and onsite sensing. Scholars from the McGill Faculty of Law are now participating in the project.

The cemetery is currently a mix of graves in various stages of archaeological documentation, some of them being merely identified through test-pitting or surface visible remains, others being partially or fully excavated, others still being excavated and their remains studied and processed in the laboratory, and reassembled as exhibits. The remote and onsite sensing researchers on the team have a ready made experimental situation in which to develop and test methods for the identification of graves of various types, from individual to mass graves. They have known graves on which to develop and refine methods, and a large area (< 1 acre) of possible or suspected graves on which to test those methods. Over time, the archaeologists are using excavation to

test the predictions of the remote and onsite sensing researchers as to the location and nature of graves, and the extent of the cemetery.

Because the park has been a major feature of the local community, and a major employer for over a generation, there is considerable local oral tradition about the park and its cemetery. There is also limited institutional memory at the park itself about what is in the cemetery and where. These local stories are being recorded and compared with the results of excavation and sensing in order to determine in what ways they relate to the actual material record. There has been considerable community interest in the project. The archaeological survey of the suspected extent of the cemetery and surrounding areas has also turned up significant historical remains dating from the 18th century onwards, some of which are co-mingled with documented animal graves. The project is therefore producing a record of how later events modify and mix with earlier remains and how they are perceived locally and integrated into local traditions.

Mass Graves, Interdisciplinary, Community Based Approaches

D24 Remote Detection of Clandestine Graves: A Comparison Across Ecosystems

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After attending this presentations, attendees will gain an understanding of the use of remote sensing for detecting clandestine graves across a range of ecosystems. The fundamental concepts of remote sensing utilizing the reflectance of solar radiation are presented as applied to forensic investigations of clandestine graves.

This presentation will impact the forensic science community by demonstrating how imaging spectroscopy can be used to detect the spectral signature of subsurface cadaveric decomposition in a range of ecosystems. This technology goes beyond the simple detection of "disturbed soil" and illustrates how cadaveric decomposition affects the reflectance of soils in a similar way in varying ecosystems from tropical to temperate.

Remote sensing in the earth and planetary sciences is a well developed field with several proven applications in geology, forestry, ecology, marine sciences, defense and security, biogeochemistry, and agriculture and soil sciences among many others. The transfer of this technology to forensic investigations has been relatively recent. This form of remote sensing utilizes solar radiation to infer characteristics about the Earth's surface. The solar radiation reflected from the surface to field-portable, airborne and satellite sensors is recorded across of range of hundreds of narrow, discrete wavelengths of light. Specific patterns in this reflected radiation (i.e., spectral signatures) can be used to determine the nature of the material or objects on the Earth's surface or in more precise studies to identify individual targets such as vegetation types, vegetation health, mineralogical compositions, and water content of soils, among many other others.

For several years, a critique of this technology had been that "generic" disturbances in the soil would lead to several false positives in the detection of clandestine graves, which, from a solely contextual perspective, such as the interpretation of aerial photos resemble other forms of disturbance. In these critiques; however, the spectral information from the hyperspectral domain was often neglected.

The potential of differentiating the reflectance of subsurface cadaveric decomposition from generic soil disturbance in a seasonal tropical environment has been recently shown in the literature from field spectroscopic and airborne imaging spectroscopy.

This research is part of an ongoing interdisciplinary research program investigating the detection of clandestine burials across ecosystems. A comparison in the similarities of the spectral signatures from field and airborne imagery across contrasting ecosystems: tropical seasonal (distinct dry season with no rain), tropical rain forest (limited dry season and overall precipitation in excess of 4m), and temperate (distinct summer and winter with freeze-thaw cycles). In each ecosystem the graves examined are animal proxy graves, encompassing a wide range of species from cattle in the tropical systems to elephant, zebra, buffalo, and several unknowns in the temperate environment. Additionally, a broad temporal range in the ages of the graves from one week to over six years at the time of data collection.

Each of the graves consisted of one to several bodies interred in soil. The spectral signatures of the graves differed from reference non-grave soils and "disturbed" soil in each environment. Furthermore, similarities in the spectra of the grave soils were observed across environments indicating that subsurface cadaveric decomposition alters the soil reflectance in similar ways in different ecosystems with different soil types, climates, and ages of the burials, and species compositions. Physical soil chemical composition and temperature, vegetation reflectance and vegetation pigment concentration data corroborate the findings from the soil spectral data. The similarities in the spectra of the graves from the various ecosystems can be used to further develop detection methodologies that can be applied to airborne or satellite imagery.

Remote Sensing, Clandestine Graves, Detection

D25 A Comparison of Conventional or Plain Radiography Versus Computerized Radiography (CR) in Forensic Imaging

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After attending this presentation, attendees will have a better understanding of the two types of digital imaging systems that are being integrated into medical imaging, the advantages and disadvantages of each, and a comparison between one of the systems, Computed Radiography, CR, and conventional x-ray film. In addition, attendees will learn the benefits of an industrial CR in cases of suspected child abuse.

This presentation will impact the forensic science community by explaining why digital radiography should be integrated into forensic setting as it has been into the medical setting. Although the initial cost of the switch is considerable, the savings over time would be significant. In addition, the ability to adjust the appearance of the imaging following processing would eliminate the need for repeat exposures. However, dedicated medical CR systems may not provide optimal images in all situations. On the other hand, industrial CR would provide more imaging flexibility and the higher image resolution necessary in cases of suspected child abuse.

In medical imaging, film, the principle recording medium since 1895, is rapidly being replaced by one of two digital imaging systems: computed radiography (CR) and direct digital radiography (DR). Both systems have numerous financial advantages over film, but there may be disadvantages for forensic applications. This presentation will compare the image quality of one of the digital systems, CR, with conventional film in a forensic setting. In addition, a comparison will be made between medical and industrial CR image receptors, demonstrating the benefits of the latter.

Eliminating film as the recording medium in forensic imaging has a number of advantages, but care must be taken to avoid the limitations of digital imaging systems that have been designed for medical applications. Algorithms for medical applications are designed for hydrated living tissues and based on lower radiation doses. In order to achieve the low dose, pre-set algorithms sacrifice image detail. Because of this, medical applications are less than satisfactory for demonstrating forensically relevant defects such as a non-displaced rib fractures in deceased children. Also, because these systems were developed for hydrated tissue, images of skeletal material are less than optimal. An industrial CR system, in contrast, is based on five to ten times the radiation dose of a medical system. It produces an image with high image resolution and employs various algorithms developed for materials ranging from plastics and rubber to metals such as steel and aluminum.

All radiographs were taken at the Office of the Chief Medical Examiner for the State of Connecticut in Farmington, Connecticut. Anterior-posterior, AP, and lateral projections of the skull and chest were taken on a cadaver with three systems: conventional film in a cassette, Konica medical CR, and Fuji ST-VI CR plates. The conventional films were processed through a Kodak automatic processing unit, the Konica plate with a Konica CR reader with medical algorithms. The Fuji plates were placed into a Fuji high resolution (HR) CR reader capable of 50-micron resolution. A sudden infant death case was examined using the same three systems. Selected areas from each set of images were compared to determine the best resolution.

Digital radiography should be integrated into forensic setting as it has been into the medical setting. Although the initial cost of the switch is considerable, the savings over time would be significant. In addition, the ability to adjust the appearance of the imaging following processing would eliminate the need for repeat exposures. However, dedicated medical CR systems may not provide optimal images in all situations. On the other hand, industrial CR would provide more imaging flexibility and the higher image resolution necessary in cases of suspected child abuse.

Forensic Radiography, Forensic Imaging, Computed Radiography

D26 The Shroud of Turin as an Object of Forensic Science Investigation

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The goal of this presentation is to present an overview of the scientific data that exists with respect to the Shroud of Turin and its image in order to encourage new collaborative studies that involve the methods and techniques of applicable forensic sciences.

This presentation will impact the forensic science community by helping attendees who wish to contribute their particular expertise to the understanding of the Shroud as a legitimate forensic object, and could increase the knowledge of the Shroud from a forensic perspective.

The Shroud of Turin is a long rectangular cloth that exists in the Italian city of Turin. This cloth appears to bear full-size frontal and dorsal images and apparent bloodstains of a human male. It is seriously thought to be by many to be the burial cloth of the historic Jesus. This paper is presented at this time to coincide with a public showing in Turin of this cloth.

The Shroud of Turin was allowed to be examined for five days (around the clock) during October 8-13 in 1978. This examination was conducted to extract, in a non-destructive manner, scientific data for

later hypothesis testing pertaining to image formation and authenticity (with respect to the hypothesis that the Shroud is the historic burial shroud of Jesus). The data collections included sticky tape sample removal, Spectral reflectance and UV fluorescence photography, close-up photography, spectral reflectance spectroscopy, x-ray radiographic imagery, and x-ray fluorescence. The results of these data collections and their subsequent analyses were published in the peer-reviewed scientific literature which are available for reference and study. The two major conclusions from the scientific team, working collaboratively, were: (1) that the image on the Shroud, which contains no evident extraneous substances that can be associated with the image color, is chemically a degradation of the cellulose; and, (2) that the blood-like stains on the Shroud are indeed blood.

Ten years later, in 1988, the Shroud was subjected to radiocarbon analysis, which yielded a radiocarbon date of mid-Fourteenth century. Certain challenges to this result are currently under investigation based on possible contamination from air-borne carbon-containing molecules.

From the available scientific data that is presently available for the Shroud, collaboration is encouraged and even solicited from the forensic community to formulate and test hypotheses via the Scientific Method in order to advance proper understanding of the Shroud and its image. The presentation will discuss several example topics where forensic input might be useful from scientific, cultural, and historical perspectives. Finally, collaborative ideas may be suggested from the forensic community regarding how modern techniques might acquire useful data from the Shroud of Turin in a non-destructive manner for further hypothesis testing.

Shroud of Turin, UV Fluorescence, Forensic

D27 Optimizing Radiographic Image Quality in the Postmortem Investigation of Child Abuse

Tania Blyth, MHS, 169 Watch Hill Road, Branford, CT 06405; and Gerald J. Conlogue, MHS, c/o Diagnostic Imaging Program, Quinnipiac University, 275 Mount Carmel Avenue, Hamden, CT 06518*

After attending this presentation, attendees will gain a further appreciation of the importance of skeletal imaging in the investigation of sudden, unexplained deaths in infants and children. The attendees will acquire an understanding of the imaging techniques necessary to optimize image quality, and therefore, to best demonstrate subtle fractures.

This presentation will impact the forensic science community by providing an understanding of the imaging techniques recommended in order to enhance radiographic image quality and discussing the techniques which should be avoided during postmortem pediatric skeletal imaging.

This research includes 29 deceased infants and children aged several days to five years that underwent autopsy and radiographic examination at the Office of the Chief Medical Examiner in Farmington, Connecticut between the period of December, 2005 and December, 2007. "Babygrams" and skeletal survey examinations were performed. In addition, various combinations of image receptor speeds (400, 100, and 50 relative speed index (RSI)) were used in order to observe the differences in recorded detail for each image receptor speed. To establish optimal exposure factors for various sized infants and children, the length, weight, kVp, mAs, RSI, source-to-image distance (SID), and the presence or absence of a grid were recorded. Bilateral oblique views of the thorax were included in the protocol to determine if those projections enhanced the ability to detect rib fractures in these cases.

Two of the cases demonstrated rib fractures and the affected ribs were extracted and specimen radiographs were performed.

The results of this study confirmed the superiority of the skeletal survey images over the "babygram" images as anticipated. In addition, 50 RSI image receptors offered superb recorded detail compared to the 100 and 400 RSI counterparts. Rib fractures demonstrating abundant callus formation were present in two of the 29 cases (case # 1 and case #29). Both infants suffered from multiple bilateral fractures of the posteriolateral ribs. AP thorax radiographs in case #1 demonstrated evidence of healing fractures of the left 3rd-6th and right 2nd-7th posteriolateral ribs with abundant callus formation bilaterally. Addition of AP oblique views of the thorax provided improved fracture visualization and demonstrated abundant callus formation and possible new fractures through the bony callus. Specimen radiographs provided improved visualization of the fracture sites and confirmed the new fractures through the bony callus; however, no additional fractures were identified in case #1 through this method since the bony callus allowed for easy fracture visualization.

The initial AP radiograph of the thorax in case #29 failed to demonstrate evidence of bony thoracic trauma. The addition of AP oblique views of the thorax resulted in visualization of multiple rib fractures with callus formation of the left 4th-6th posteriolateral ribs. The entire thoracic cage was removed at autopsy and specimen radiography was performed using 50 RSI image receptors. The specimen images resulted in improved visualization of the left posteriolateral rib fractures which were also easily visualized upon gross inspection. However, specimen radiographs revealed multiple fractures of the right 4th-6th posteriolateral ribs which were not easily visualized on the previous radiographs or upon gross inspection. Additionally, a 3° cephalic angle was utilized in order to demonstrate the fractures from another perspective and further enhanced the visibility of the fracture of the 5th rib.

Many child abuse fractures are subtle and can easily be overlooked, therefore optimal images are critical. In order to produce images with the best diagnostic quality, specific protocols and image receptors must be used, and "babygrams" should never replace skeletal survey examinations. Proper positioning of the anatomy is imperative, otherwise fractures can be missed. The addition of oblique views of the thorax increased the fracture yield in case #29 and proved to be beneficial since rib fractures have a high specificity for abuse and oblique views can increase the visibility of such fractures. In this study, the addition of a 3° cephalic angle during specimen imaging better demonstrated the fracture line of the right 5th rib in case #29. This finding reinforced the fact that the relationship between the x-ray tube, anatomy, and image receptor plays a significant role in fracture visualization, particularly with rib fractures.

Radiography, Child Abuse, Rib Fractures

D28 Inadequate Investigation Impedes Determination of the Manner of Death

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After attending this presentation, attendees will have learned the importance of on-scene investigation in the determination of the manner of death.

This presentation will impact the forensic science community by demonstrating the consequences of an inadequate on-scene investigation and collection of evidence.

The importance of a thorough and meticulous on-scene death investigation cannot be over-emphasized. The failure of law enforcement to adequately recognize, document, and collect evidence at the scene may impede the medical examiner's ability to determine the cause and manner of death.

The body of a 25-year-old, Caucasian male (D.S.) was found at the edge of the woods on his "best friends" property. D.S. was found to be on his knees with his upper body and head flopped forward with his face on the ground and mud in his mouth. The family of the decedent, reported that he had recently been arrested for public intoxication and reported on a "suicide watch" while incarcerated. The family also reported that D.S. had one prior suicide attempt and is known to have "no friends and hangs around drug dealers." After being released from jail two weeks prior to the death, he had been residing with his "best friend" who reportedly argued with D.S. on the morning of the incident secondary to "drinking his beer" and had told him he needed to move out to "watch dirty movies." No suicide note was located.

The "best friend" found the decedent's body approximately 90-yards from the house. Two revolvers were found at the scene along with two spent shell casings in one of the handguns. One weapon was found in the pocket of D.S. and the other was found lying on the ground next to his left foot and a large pile of cerebral tissue. Both firearms were noted to be .357 magnums. At the insistence of the law enforcement officer a gunshot residue test was not performed at the scene. D.S. is reported to be right handed.

At autopsy, the body was found to have an explosive type stellate, hard contact gunshot wound to the right forehead, a graze wound of indeterminate range over the right eyebrow with associated tattooing, and a perforating contact gunshot wound with near amputation of the right index finger with a large amount of soot present. No exit wound located. Toxicology was positive for alcohol and cannabinoids. The brain was within the body bag in a separate biohazard bag. No projectiles were found on physical or radiographic examination of the skull or bagged cerebral tissue.

The trajectory of the right forehead wound is noted to be from front to back, right to left, and downward. The path of the projectile of the right forehead graze is noted to be from front to back with minimal rightward and up deviation.

Review of the coroner and law enforcement investigative reports failed to reveal that a gunshot residue test was performed. In addition, the reports did not indicate that the ground surrounding the victim was examined for additional footprints.

Most forensic disciplines assume that a decedent who has been shot more than once is a victim of homicide, and usually they are correct. However, forensic literature has multiple cases of multi-shot suicides. When presented with a victim with multiple gunshot wounds the investigating agency must use extreme caution in assuming the manner of death to be either homicide or suicide. Special attention must be paid to recognize, preserve, and collect on-scene evidence if the forensic pathologist is to be able to determine the manner of death. The loss of the trigger finger on the right hand of a right-handed individual is of concern if the individual was to have fired both rounds with his dominant hand.

The possible failure to collect all of the biologic material surrounding the head wound at the scene may have resulted in the inability to locate the offending projectile. In addition, the on-scene law enforcement agency advised the coroner that an autopsy was not necessary for this "obvious suicide." The manner of death in this case remains undetermined secondary to inadequate on-scene collection of evidence.

Suicide vs. Homicide, On-Scene Investigation, Evidence Collection

D29 Interactions Between the German Cockroach (*Blattella germanica*) and Pooled Bloodstain Patterns

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After attending this presentation, attendees will have a better understanding of bloodstain pattern analysis and interactions between cockroaches and bloodstains.

This presentation will impact the forensic science community by increasing knowledge of insect stains, specifically those made by the German cockroach (*Blattella germanica*), and bloodstain patterns at crime scenes; this will result in a more accurate bloodstain pattern analysis.

Bloodstain pattern analysis can assist in reconstructing a sequence of violent events at crime scenes. Yet, bloodstain pattern analysis can be confounded by the behavior of insects that use blood as a food source. For example, cockroaches have been reported anecdotally to change the shape of bloodstain patterns and form additional patterns (insect stains) through feeding. At present these changes are poorly understood. To improve understanding of these processes, a laboratory experiment was conducted to observe the interactions between German cockroaches (*Blattella germanica*) and pooled bloodstains. The null hypothesis was tested that German cockroaches will not alter the morphology and presumptive chemistry of pooled bloodstain patterns over a period of 48 hours.

This experiment was conducted in a microscene. A microscene is a 47.5 cm³ wooden box with two glass walls, two wooden walls and a Plexiglas ceiling. The two wooden walls were covered with wallpaper and the floor was covered with linoleum. Six milliliters of freshly drawn human blood was pooled on the linoleum. Five cockroaches were then added to the microscene. Cockroaches were kept in the microscene for 48 hours. After this time three presumptive blood tests were used (phenolphthalein, leucocrystal violet, Hemastix[®]) to determine if cockroach stains tested positive for blood. This experiment was replicated four times and controls (blood without cockroaches) were used.

During the initial 30 hours the cockroaches did not alter or feed on the bloodstains. Cockroaches walked around pooled bloodstains when moving throughout the microscene. In the final 18 hours, however, cockroaches fed on bloodstains and formed insect stains via defecation and tracking (transferring blood from feet or abdomen to surface). Insect stains were present on the linoleum floor only and could be confused with impact bloodstain patterns. No significant differences existed when testing insect stains and blood with Hemastix[®] and phenolphthalein. However, insect stains did not react with leucocrystal violet.

Insect Stains, Bloodstain Pattern Analysis, Insect Artifacts

D30 Weapon Width Determination Using Cast-Off Blood Spatter

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The goal of this presentation is to show attendees that cast-off blood spatter can be useful in the determination of weapon width using both the phenomenon of side-by-side blood drops within cast-off spatter trails and the proportionality of width between the spatter trails and respective weapons of use.

This presentation will impact the forensic science community by demonstrating the phenomenon of weapon determination using cast-off blood spatter and its application in the investigation and discovery of the weapon in question in forensic casework, including analysis at the crime scene.

Bloodstain pattern analysis can be a very useful aid in the investigation and reconstruction of a crime. Created when blood comes in contact with a surface following a bloodshed event, key pieces of information may be obtained including the object in question and the minimum number of blows. Different bloodshed events produce varying bloodstain patterns. Impact spatter, and more particularly cast-off blood spatter, is created when blood is flung or projected from an object in motion, following adherence of a sufficient volume of blood to the object. When swung, blood will be propelled off the end. This action is the result of the angular momentum overcoming the surface tension of the blood. The result of such action is distinct linear patterns, or trails, of bloodstain. SWGSTAIN defines a cast-off pattern as a bloodstain pattern resulting from blood drops released from an object due to its motion.

Crime scene casework has seen the potential of side-by-side drops, an uninvestigated cast-off blood spatter stain phenomenon. The objective of this research is to investigate the phenomenon of observed side-by-side cast-off blood spatter stains to determine the relative size of the swinging object. As different objects have more surface area and create different linear patterns, the volume of blood present on the object and the width of the object are important in the determination of the object of interest based on the examination of the resultant cast-off pattern. By varying weapon characteristics, experimentation will be conducted to confirm this principle. Observations of spatter trail widths will also be performed for comparison to the weapon of creation's widths.

In this study, twenty-five objects of varying sizes, construction, and dimensions commonly used as weapons were used to generate cast-off blood spatter for analysis. These objects included tools/building materials (pry bar, an adjustable wrench, two different sizes of hammers, a wooden stake, a metal ruler, painters' pole, brick and two different sizes (length and diameter) of PVC piping), metal blades (switchblade, butter knife, axe, and machete), and sport equipment/miscellaneous items (plastic bat, golf club, hair brush, spatula, hardcover book, remote control, plastic sword, wine bottle and ice scraper). Each weapon was moved in a manner analogous to a bloodshed event producing cast-off spatter. Observations were made regarding the width of the spatter trails and the presence of any side-by-side drops.

Twenty-two of the weapons produced the desired side-by-side drops, with the other three illustrating alternate results. Both the axe and switchblade resulted in vertical drop pairings, corresponding to the height, rather than the width of the weapon blade. The butter knife was the only weapon to result in no visible pairings. Following repeated experimentation, the results were found to be reproducible. Proportional spatter trail widths were also observed for all weapons used. Overall, the results of the experimentation were able to demonstrate the correlation between weapon widths and spatter trail width. The appearance of side-

by-side stains was also observed, supporting the aim of this project.

Cast-Off Spatter, Weapon Width, Side-by-Side Blood Drops

D31 Stressors, Needs, and Management of Death Notification for the Working Professional

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The goal of this presentation is to inform attendees of the need for formal death notification training, primarily from the perspective of stress management and awareness for the notifier.

This presentation will impact the forensic science community by making professionals aware of the effect that death notifications have on the notifier and the suggested solutions for this traumatic task.

The emotionally difficult task of informing a survivor that their loved one has died is an assignment that is necessary, yet traumatic, for everyone involved. While this understudied area is reviewed largely from the perspective of how to assist the loved one's next-of-kin, studies have not fully addressed how the notification affects the individual delivering the bad news. Forensic professionals, including death investigators, crime scene personnel, and even laboratory analysts, may face this situation in their professional roles.

What must be considered is that any forensic professional who is exposed to a case involving death is potentially exposed to the trauma of death notification. Whether they make the notification personally, or are present at a scene where a notification occurs, forensic professionals need to be prepared to deal with survivors of the deceased. While some professionals may take the attitude that notification is just part of the job and that they don't need any assistance, studies in this presentation show effective notification delivery skills and stress management tools for notifiers to follow.

The leader in death notification study and training is the group Mothers against Drunk Driving (MADD). The research, protocol and training that MADD performs have opened a door toward conducting effective death notifications as well as strategies to reduce stress and trauma for the notifier. In this presentation MADD's suggestions and protocol are combined with research results of Lord, Stewart, and Mercer whose extensive survey of 245 professionals provides information relative to notifier stressors including causes of death, survivor reactions, and methods used to cope with the difficulties associated with notifications.

The Lord, Stewart, and Mercer study also showed that 70% of participants had performed at least one death notification; however, nearly 40% of these participants had never received formal training in death notification. The call for training in delivering effective notifications as well as the need for professionals to implement stress management tools is a need that should be continually addressed. Ultimately, the goal is the well-being of the survivors and the ability for forensic professionals to continue in their respective professions with good mental health and effective work relationships.

Death Notification, Stress Management, Communication

D32 Remote Hyperspectral Imaging of

Human Remains

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After attending this presentation, attendees will have a better understanding of the role that remote hyperspectral imaging could play in the search for human remains.

This presentation will impact the forensic science community by providing a possible method for detecting human remains via remote sensing using hyperspectral imaging cameras that are sensitive in the shortwave region of the electromagnetic spectrum.

Human skin has been shown to possess characteristic reflectivity in the infrared region of the electromagnetic spectrum. Previous research using a hand-held short-wave infrared (SWIR) spectrometer has revealed that there are key wavelengths that can be used to distinguish skin and bone from foliage and other environmental objects. As a result, the current research study was designed to investigate the ability of an airborne SWIR hyperspectral system to detect human remains.

To determine the viability of differentiating spectral signatures of human skin from background variables, data were collected from decomposing remains at the Anthropological Research Facility at the University of Tennessee at Knoxville using portable SWIR spectrometers. Libraries of these data were developed, along with data on live human skin, and common environmental factors such as vegetation, roofing, asphalt, and other debris. Following development of the spectral libraries, principle component analysis was performed to create data models, which were subsequently tested using a soft independent modeling of class analogy (SIMCA) classification. The SIMCA results revealed that the PCA models were able to distinguish between the spectral signatures of human skin versus environmental variables. In addition, SIMCA results were used to demonstrate that live human skin and skin from human remains are spectrally similar.

Once it was determined that the categories of interest for this project were each spectrally unique in the SWIR region of the electromagnetic spectrum, the concept was applied to hyperspectral imaging (HSI). HSI allows for the collection of spatial and spectral data simultaneously, creating a "data cube" which can be used to chemically classify objects in an image. The spectral profile collected for each pixel contains reflectance data characteristic of the material or combination of materials present in that location in the image. By processing the hyperspectral images using commercial image analysis software, spectra in the image can be matched to reference spectra, allowing for the detection and visualization of specific substances or objects.

Tests using an airborne hyperspectral system (400-2350nm) have been completed. A small human remains sample was placed on the ground along with live skin subjects, various test materials, and debris. Hyperspectral images were obtained at altitudes ranging from 200-1500 ft from a helicopter hovering over the target area. Using reference spectra, each image was calibrated and atmospherically corrected. The Spectral Angle Mapper (SAM) classification method was used to match spectral library data from skin to spectra from the airborne images. The reference spectra were successfully matched to spectra within the images, and the corresponding pixels were then classified and illuminated accordingly. These results suggest that airborne hyperspectral imaging can be used to remotely detect human remains.

Remote Sensing, Hyperspectral Imaging, Human Remains

D33 Suicide Notes: What Are the Victims Trying

to Tell Us?

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After attending this presentation, attendees will gain knowledge in the motivation of suicide victims. Suicide notes offer the only insight into the mind of the victim. These suicide notes, recovered from actual cases, have been analyzed for theme, content, and demographic information.

This presentation will impact the forensic science community by serving as a key aspect into the behavior and thoughts of those committing suicide. It will provide further incite to criminal investigators and medical examiners to aid in the determination of manner of death.

Each day in the United States, between eighty and ninety individuals commit suicide. Suicide is the eleventh leading cause of death in the United States. For young men between 15 and 24, it is the third leading cause after accidents and homicide. The suicide victim leaves uncounted "victims" that are friends and family who struggle to determine why this happened. Medical professionals have looked to chemical imbalances and brain defects to explain suicide. Criminal investigators and medical examiners labor with lengthy investigations and testing to determine the mindset of the suicide victim so they can conduct an adequate investigation and correct classification for manner of death. The U.S. Military is having an unprecedented number of suicides with the rate rising each of the last four years. This had lead to the U.S. Army developing new programs and studies to help prevent suicides.

A number of studies and theories on suicide indicate that the suicide victim has feelings of hopelessness. They feel that they are a burden on others and society. When they are caught in a personal crisis, their reaction is to end their lives. In the vast majority of cases, the motivation is for suicide will never be known, only about 30-35% of suicide victims leave a note showing their intention.

Suicide notes from actual cases were collected for this research. They were analyzed using a qualitative research method known as "Grounded Theory." This method, developed by Anselm Straus and Juliet Corbin, has been used in sociological research to get to the meanings and themes of dialogues and discourses of individuals. The suicide notes themselves offer the thoughts of the victim at or near the time of death. It is their dying declaration.

This presentation will provide the results of that research. It will provide insight into their behavior and motivation for suicide. Common themes will be revealed of suicide victims and provide investigators information that can be used in determining manner of death.

Suicide, Notes, Criminal Investigation

D34 A Case Study of a Suicide in the Mountains of Cyprus - Focusing on Postmortem Changes

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After attending this presentation, attendees will be familiar with the difficulties of working a death scene in the extreme conditions of the Cypriot Mountains and the unique postmortem changes that occur in the harsh environment

This presentation will impact the forensic science community by exposing attendees to postmortem changes and activities, including putrefaction, mummification, adipocere, antemortem, and postmortem injuries, as well as insect activity, and animal activity.

In July 2007, a decorated U.S. Army Colonel, serving as the Defense Attaché at the United States Embassy in Cyprus was reported missing. It was believed by the Associated Press and the U.S. Ambassador that the Colonel may have been abducted by one of a several organizations hostile to the U.S. Mission in the Middle East. An extensive search by the Cypriot police and the Cypriot Military was initiated. The U.S. Ambassador requested assistance from the U.S. military. A joint Department of Defense team of Special Agents was formed through the U.S. Army European Command, consisting of Special Agents from the U.S. Army Criminal Investigative Command, the U.S. Air Force Office of Special Investigations, and the U.S. Naval Criminal Investigative Service. This team gathered in Nicosia, Cyprus and assisted the Cypriot Police and the Foreign Service Office Investigator of the U.S. Embassy during their investigation. The formal investigation showed the Colonel was not abducted, but had taken his own life in the austere conditions of the Cypriot Mountain Range.

The Colonel committed suicide by slicing his neck with a sharp paint scraper extending from just below the left ear to about midline of the neck. The carotid artery was nicked as a result of the slice, as well as damage to the jugular vein, and the Colonel slowly bled to death. Evidence from the scene and the autopsy confirmed that the cause of death was exanguination as a result of the damaged artery and vein. Suicide as the manner of death was confirmed through normal investigative measures such as interviews, scene analysis of multiple scenes, and computer forensics.

In the time after death, the severe conditions of the mountain range caused several postmortem changes that are rarely seen together. The putrefaction caused severe blotching of the skin. This led several newspapers to report the Colonel was severely beaten and that the cause of death was a murder. These reports were incorrect and were due to leaks of pictures and information from within the police force. The extreme heat and dry air caused mummification to occur on the Colonel's hands. Additionally, sweat from his bout of shock became trapped when the Colonel laid down in the shade and created a small area of adipocere on the Colonel's back. The injury to the Colonel's neck provided an area of antemortem injury. However, animals and insects were drawn to the area of injury after death and caused several postmortem injuries. There were also several areas of animal activity on the Colonel's right leg. Taken together, the areas of postmortem activity and changes provides an excellent opportunity to refresh one's knowledge in these areas.

Suicide, Cyprus, Postmortem

D35 Front Line Forensics: Expeditionary Forensic Facilities in Iraq and Afghanistan

Edmund D. Tamburini, MFS, United States Army Central Identification Lab, 4930 North 31st Street, Building 925, Forest Park, GA 30297; and Robert C. Gaffney, MFS, MBA*, United States Army Central Identification Lab, Investigative Support, 4930 North 31st Street, Forest Park, GA 30297-5205*

After attending this presentation, attendees will gain knowledge about the use of forensics and biometrics to identify, arrest, and bring to justice terrorists in Iraq and Afghanistan.

This presentation will impact the forensic science community by providing information and knowledge on the impact of forensics in the global war on terrorism. Forensics is used on a daily basis to identify terrorists, develop methods to protect individuals, and deter terrorists.

The concept of battlefield forensics is not new to the Global War on Terror or the military actions in Iraq and Afghanistan. This concept

dates back to WWII when a mobile lab was used throughout North Africa, Italy and France to investigate fraud, homicides, and war crimes. Since World War II, the U.S. Army developed several "stationary" criminal laboratories in Japan, Germany, and the United States. These stationary labs were consolidated into one crime laboratory for all military services at USACIL, Forest Park, GA in 1996.

The U.S. Marines recognized the value of forensics in identifying snipers and bomb makers during the insurgent phase of the War in Iraq. This led to the development by the U.S. Army and Navy of the Joint Expeditionary Forensic Facilities (JEFF) with the mission to use ballistics, latent print, and DNA analysis to identify sniper and IED threats.

The JEFF labs returned to the World War II concept of mobility. To remain effective, the labs had to be near the conflict and move as the insurgency moved to other areas of the country. The labs also serve to assist Iraq into returning to a "Rule of Law."

There are presently six JEFF labs operating or under construction in Iraq and Afghanistan. They provide a scientific and methodical approach for evidence exploitation while providing general support to theater by providing customers with specific forensic applications or full spectrum forensics analysis.

This presentation will provide the audience an overview of battlefield forensics and how forensics has become an integral part of the military mission. The labs have provided a comprehensive program for oversight of forensics collection, handling, analysis, intelligence reporting, case development, storing, and disposition. They also provide standards for supporting Iraqi and Coalition Forces for intelligence, investigative, and judicial processes. The presentation will also provide information on situations that are unique to the battlefield forensic lab.

A case study of the use of forensics in a battlefield environment will also be presented.

Battlefield Forensics, Terrorism, Criminal Investigation

D36 Interdisciplinary Forensic and Investigative Efforts Paramount for Resolving Violent Crime

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After attending this presentation, attendees will understand the importance of methodical crime scene processing, the necessity of employing a multi-disciplinary scientific approach when conducting violent crime investigation, the tenacity required in violent crimes investigation once the "shock" of the initial report has subsided, and the enduring and critical role of "old-fashioned" detective work when investigating violent crime, particularly serial crime.

This presentation will impact the forensic community by demonstrating that significant advances in technology still rest upon time-honored crime scene processing and investigative techniques. New technology, bolstered by the effective use of the wide spectrum of scientific disciplines within the forensic community, and coupled with major case management, are all critical components to effectively resolve violent crime, particularly serial crime.

With the advent of DNA and other technologies, the days of being unable to link crimes committed in varied jurisdictions to a "travelling" serial criminal are quickly coming to an end. Despite the developments in technology, which allow near real-time access to the report, and investigation, of crimes literally around the world, the efficacy of all efforts is still directly tied to the initial police response, the initial crime scene processing, and the effective cooperation of investigating agencies across jurisdictions. Research of and incorporation of the psychological or crime scene assessment of violent crimes rests upon those similarities

noted at varied crime scenes. Recognizing and documenting relevant facts remains largely dependent upon the experience of the responding investigative personnel, the tenacity of the investigator assigned to pursue the information, and the willingness of law enforcement to share information, pool resources, and cooperate to resolve serial crimes.

A case study will be presented which illustrates how the initial methodical approach to processing a crime scene, leveraging of the multi-disciplinary approach in the subsequent advanced and continued processing of the crime scene, the management of a task force, and the incorporation the forensic pathology and laboratory findings, combined with the efforts of traditional stalwart investigative methods, resulted in identification of a violent serial offender

Crime Scene, Serial Crimes, Investigation

D37 Battlefield Forensics: The Application of Traditional Criminalistics/Forensics on the Battlefield to Support Combat Operations

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After attending this presentation, attendees will have a better understanding about how military personnel are trained to collect forensic material on the battlefield. Attendees will also understand how military personnel are trained to prioritize evidence on an objective, how to protect, document, preserve, collect and transport forensic material, but also how to process items expeditiously at the scene in order to develop and collect latent evidence, such as fingerprints, DNA, shoe impressions, etc.

This presentation will impact the forensic science community by discussing the application of traditional forensic/criminalistics techniques on the battlefield for intelligence and operational purposes. Combat actions in Iraq and Afghanistan have identified a need across the Department of Defense to increase the ability to collect and exploit forensic materials for targeting and/or prosecution. The Army must substantially increase the training and ability of soldiers to identify, collect, preserve, and process forensic material with potential evidentiary value. This skill, normally performed by military investigators during garrison law enforcement operations and by specialized crime scene teams in civilian law enforcement, must be done by deployed soldiers in both Iraq and Afghanistan, regardless of Military Occupational Specialty (MOS).

Forensic Material Collection and Exploitation Course will train the collection, processing, and preservation of forensic material on an objective or site. Students will be taught not only the basics, such as how to prioritize evidence on an objective, how to protect, document, preserve, collect and transport forensic material, but also how to process items expeditiously at the scene in order to develop and collect latent evidence, such as fingerprints, DNA, shoe impressions, etc. The course will consist of both classroom training and hands-on practical exercises. This training will be geared towards selected soldiers preparing for deployment who will serve as part of a unit's forensic material collection team. Each team member will be cross-trained in every area, to include photography, sketching, note-taking, latent print processing, and trace evidence collection.

Battlefield, Forensics, Criminalistics

D38 Evidence From Forensic Botany in Establishing Time of Death in

Incarcerated Persons

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After attending this presentation, attendees will be able to understand how prison and hospital records can be used to help in determining the time frame for deaths of inmates and patients as well as elimination of some possible suspects.

This presentation will impact the forensic science community by providing a little used and inexpensive method for narrowing the possible time of death and suspect in a suspicious death when the victim is a confined person.

Two cases where prisoners were murdered were investigated. In one case, the prisoner was in a state prison. In the other, the person was confined in a prison for the criminally insane. Fellow inmates were suspected in both crimes.

In both cases stomach content samples were provided as well as autopsy reports. In both individuals, the digestive tracts appeared to be normal. Menus for the full days meals on the deaths of the prisoners were also provided.

The objective of this evaluation was to determine the last meal that was consumed by the prisoners in order to eliminate some suspects and to evaluate testimony given by fellow inmates about their whereabouts and their observations of the victims' movements around the time of their deaths.

In both cases it was determined the contents of the last meals could be defined. In one case, due to the condition of the stomach contents, it was determined that the prisoner was likely to have died shortly after meal consumption. In the second case, the nature of the last meal could be stated in comparison with the details of the prison menu; but there was a complicating factor. This prisoner was a hoarder. He had sequestered a great deal of food in his cell. However, the nature of the last known meal was still clearly indicated by the stomach contents.

Forensic Botany, Time of Death, Incarcerated Persons

D39 A Crime Scene That Included Six Vehicles, Fifty-Eight Cartridge Casings, and Over Twenty Homes: Using a Different Method of Sketching to Document Large Scenes

Claire E. Shepard, MS, Griffin Technical College, 501 Varsity Road, Griffin, GA 30223*

After attending this presentation, attendees will have learned an alternative method for sketching large or non-traditional crime scenes.

This presentation will impact the forensic science community by providing alternative documentation methods that can be used at crime scenes where traditional textbook methods are not feasible or effective.

In March 2001, police were called to a shooting in a suburban Atlanta neighborhood. Almost immediately the 911 system was flooded with calls from the same general area, regarding more shots fired, vehicles leaving the scene driving at high rates of speed, and a deceased victim dumped in a neighborhood park. Victims suffering from gunshot wounds showed up at local hospitals, and crime scenes with vehicles related to the case were located. Not long after the initial call it was determined the initial shooting occurred at the home of the prime suspect in the recent assassination of the incumbent Sheriff and a former police officer.

Due to the nature of the case, all hands were on deck. The primary scene included fifty-eight cartridge casings, four vehicles, and over twenty homes. Questions began to arise as to the documentation of the

scene in a timely manner. Since the shooting encompassed an entire subdivision, there was concern with keeping families out of their homes for an extended period of time. Also, deciding where to begin documentation of the scene was a difficult task when in addition to a primary scene there was a separate death scene, a bullet-ridden vehicle from the scene found on the interstate, and another vehicle presumably used to transport the deceased victim to the park, abandoned in a wooded area. When there are four scenes related to a homicide and two crime scene investigators on duty, where and how should the documentation begin? Not only must these scenes be worked in a timely manner, but no stone can be left unturned. Additionally while this murder investigation was beginning, it was also tied to the active murder investigation of the incumbent sheriff, a law enforcement officer.

In this case, it was determined that the traditional method of using triangulation or rectangular coordinates would be too time consuming and cumbersome for a scene of its size. Therefore the scene was divided into twenty foot sections and sketched using paint, photography, and a spreadsheet. This method provided adequate documentation of the scene and was presented in court.

Therefore, proper documentation procedures can be employed even if the standard procedures are deemed to be an inefficient method due to the circumstances of a large scene or multiple scenes that must be worked consecutively. Finally teamwork between all investigators and members of the forensic science community is essential in non-traditional scenes to get the job done legally, correctly, and efficiently.

Crime Scene Investigation, Sketching, Documentation

D40 The Obsession With Online Role-Playing Games and Child Neglect Deaths

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After attending this presentation, attendees will understand how a caregiver's obsessive on-line gaming activities can contribute to child neglect deaths.

This presentation will impact the forensic science community by bringing to light the negative impact of obsessive on-line gaming on parents' ability to properly care for their children. Supervisory neglect can often be difficult to ascertain particularly in the absence of other witnesses. This presentation supplies an additional line of questioning to the investigator which may shed some light on the predisposing or direct causes of effect in child neglect deaths.

Research on obsessive internet use and electronic gaming has provided insight into a host of potential problems not only for the individual(s) but also for those around them. Those often most at risk are children neglected due to this obsessive behavior, particularly those who lack the ability to engage in the most basic of self-care. Of the various types of child abuse, neglect is the most prevalent form. In 2007, an estimated 1,760 children died due to abuse or neglect, with 34.1% of all fatalities attributed to neglect. Physical and supervisory neglect become significant concerns when the caregiver(s) are obsessively preoccupied with the above-mentioned media. Neglect issues become even more concerning when caregivers engage in "Massively Multiplayer Online Role-Playing Games" (MMORPGs) as unlike many other types of media, there is no ability to immediately "pause" the game and MMORPGs have no termination point, leading to marathon gaming session in which all other concerns are ignored including the well being of their infants and children.

In this paper, four case studies will be presented that constitute both physical and supervisory neglect that resulted in death. In each case study, parental obsession with on-line gaming and its role in each child's

death will be discussed. In the cases presented, all children were under the age of four, with three under the age of one year. In three cases, the parents admitted to leaving their children unsupervised on average up to 14.5 hours while they either played on-line games or slept after extensive gaming sessions.

The published literature has identified several factors as "indicators" of the potential to abuse or neglect children. The indicators of abuse include depression, psychological inadequacy and poor problem solving skills amongst several others. The purpose of this paper is to propose obsessive preoccupation with MMORPGs or online role-playing as another indicator of potential child neglect. Although the obsessive behavior may be a symptom of some of the indicators noted above, it is important to explore this avenue of investigation when processing a child death scene.

Child Neglect, Online Role-Playing Addiction, Child Death

D41 "If I Had a Hammer, I'd ...": Rare Case of a Hammer Initiated Self-Inflicted Bullet Wound

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After attending this presentation, attendees will be introduced to the unique use of a tool as an improvised firearm.

This presentation will impact the forensic science community by expanding the knowledge of forensic investigators involved in the investigation of improvised firearms.

A 33-year-old Caucasian male presented to an urban Trauma Center with a complaint of pain from a reported self-inflicted gunshot wound to the left lower quadrant. There was no active bleeding and the patient only complained of slight pain. The patient admitted that this was a suicide attempt but denied having a history of depression. However, upon further questioning, he admitted to a prior attempted suicide four months earlier by overdosing on acetaminophen. At that time his family had removed his .22 caliber pistol, but not the ammunition, from the home.

Examination of the abdominal wall revealed a small, round and abraded tissue defect without evidence of soot or tattooing. Plain radiographs and a contrasted CT scan of his abdomen and pelvis revealed a round nose bullet in the subcutaneous tissue of the left anterior abdominal wall. There was no evidence of intra-abdominal injury or fascia penetration from the bullet. When questioned about the weapon, the patient explained that he had put the head of a hammer on his abdomen, then wedged a cartridge in the claw of the hammer and used a second hammer to strike its base. When the cartridge discharged, the bullet traveled into the subcutaneous tissue and stopped. When viewed on CT scan, the projectile appeared to have traveled at a 45-degree downward angle from left to right. The patient reported the cartridge was a .22 caliber long rifle.

The use of improvised firearms to inflict injury upon oneself or others is unusual. One of the reasons that handmade firearms are rare is because they usually do not provide the projectile enough velocity to travel very far and are generally ineffective. As this case indicates, the projectile had only enough energy to penetrate the skin and not enough to enter the abdominal cavity.

When fired from a gun, a .22 rimfire bullet reaches the "optimum velocity" in a 14 to 16-inch barrel. Depending upon the weight of the bullet the maximum velocity of a handgun bullet is about 1350 ft/s, but without the barrel, the bullet does not have the energy behind it necessary to reach that velocity. The minimum velocity reported for a .22 caliber bullet with a weight 16.5 grams to penetrate the skin is 245 ft/sec. Obviously the bullet must have lost its velocity very quickly

because it only succeeded in penetrating the skin and caused no intra-abdominal injuries. This failed suicide attempt presumably left no lasting traumatic injuries. The patient was admitted to the surgical service for observation with an inpatient psychiatric evaluation.

In this case, the bullet wound was a contact wound. However, the bullet and *not the barrel of the gun*, was in contact with the skin when the projectile was discharged. Because of this, the wound does not present with the usual characteristics of a contact gunshot wound. This bullet wound of contact is unique, as it has none of characteristics typical of contact gunshot wounds.

The use of a claw hammer as a platform to discharge a round is intended to inform forensic investigators of an unusual type of improvised firearm.

Improvised Firearm, Hammer, Gunshot Wound

D42 Exsanguinated Blood Volume Estimation Using Fractal Analysis of Digital Images

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The goals of this presentation are to introduce attendees to chaos theory and fractal geometry and to demonstrate how fractal analysis may be applied to the characterization of non-linear, morphometrically complex, bloodstain patterns, and ultimately lead to a scientifically reproducible means of estimating exsanguinated blood volume.

This presentation will impact the forensic science community by providing a novel approach to estimating single-event exsanguinated blood volume from blood spatter evidence at crime scenes. This method results in the deconstruction of bloodstain patterns into mathematical parameters thereby removing the subjective element inherent in previous studies. This analytical approach represents a shift from a formerly subjective field towards a more objective analytical technique that can withstand scientific and legal scrutiny.

Although the field of bloodstain pattern analysis has evolved to combine a unique set of well-defined and established scientific principles, drawing on many disciplines to characterize and interpret stain patterns, there is currently no scientifically accepted, or court qualified method of quantifying original bloodstain volume. This information may be vital in cases where a large volume of blood must be correlated to determining post injury survival time, the location of severe or lethal injuries, and the probability of death when no body is found.

The present study combines a quantitative analytical approach with an area previously dominated by subjective qualitative observations and allows the modeling of natural systems such as blood spatter. This research has led to the development of a novel fractal approach to the estimation of bloodstain volume, which deviates from the classical direct volumetric methods previously proposed by Lee (1986). Variability of the appearance of different bloodstains can be simplified and quantified into a single numerical value that defines its shape complexity, namely its fractal dimension, and are ideally suited for computer analysis, hence, removing inherent observer bias.

The central hypothesis of this analytical technique is that digital images of bloodstain patterns are quantifiable using fractal geometry, hence, each volume may be characterized by a unique Hausdorff fractal dimension. This allows the analyst to provide an estimated volume with a statistically valid methodology in order to conform to *Daubert* Standards.

Binary photographs of passive bloodstains of known volume were subjected to computer analysis using FracLac V2.0 for ImageJ. Through application of the box-counting method, the Hausdorff fractal dimension of each replicate volume was extracted from a scaling plot of these data. Generated fractals were utilized to create scatter plots yielding

logarithmic regression predictive equations for blood. Fractal curves, of known and accepted Hausdorff dimension were used to calibrate the system. The validity of the proposed methodology was assessed during a blind trial evaluation.

The results of this study indicate that chaos theory and fractal geometry may be applied in a systematic method to assist in quantitative analysis and modeling of passive bloodstains by a unique geometric Hausdorff fractal dimension through application of the box-count method. A power law relationship is observed when the box size is plotted against the number of grid boxes that contain pixels in a box-counting scan. A scaling plot was subsequently generated by performing a logarithmic manipulation of these data and the fractal dimension was extracted from the slope of the linear portion of this plot. This procedure was repeated for each replicated volume.

Passive blood stain patterns are characterized by a fractal dimension duality due to the underlying mechanisms that influence the resulting primary and secondary spatter, that in combination form the overall pattern. This study used a single line of best fit for the extraction of the fractal dimension from the generated scaling plot.

The regression yielded a logarithmic function that was predicted from the power law. The fractal dimension approached 2, asymptotically. Mathematical theory suggests that as the fractal dimension of a 2-dimensional natural object increases, it will do so as a limit, approaching, but never reaching, 2.0. At this point the pattern is no longer considered fractal and becomes Euclidean.

This study provides the basis for the estimation of blood volume from the fractal analysis of digital images; forging the way for more detailed investigations, while highlighting areas that demonstrate the potential for future research.

Bloodstain Pattern Analysis, Fractal Analysis, Volume Estimation

D43 The Steven Tauzer Murder Case

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After attending this presentation, attendees will have an understanding of the pitfalls involved when a high ranking member of law enforcement agency is murdered by fellow member of that agency and the ramifications of conflict of interest charges brought against the crime scene investigation team and the laboratory analysts involved in the case.

This presentation will impact the forensic science community by creating awareness on the complexity of murder cases that involve high ranking public officials and the ramifications of investigations by forensic laboratories situated in rural communities.

Assistant District Attorney Steven Tauzer was found murdered in the garage of his residence in September of 2002. Chris Hillis, a former lieutenant of the Kern County District Attorney's Office Bureau of Investigation was soon developed as a suspect. DNA located on key evidence was crucial in developing Hillis as a suspect. Although the case was investigated by the Kern County Sheriff's Department, the crime scene was investigated by members of the Kern County District Attorney's Office Regional crime lab (KCDA). Initial evidence processing was also conducted by personnel from the KCDA Regional Crime Laboratory (KCDA RCL). Because of the onus of 'conflict of interest', the processing of evidence was halted by KCDARCL personnel, and the evidence was then packaged and shipped to the California State Department of Justice Bureau of Forensic Sciences Laboratory. As a result of the Cal DOJ Laboratories Analysis of the DNA evidence Chris Hillis was arrested and charged with the murder of Steven Tauzer.

This presentation will focus on the evidence collected at the scene,

its processing, and the resulting interactions of the presenter with the district attorney, sheriff's homicide investigators, California Department of Justice personnel. The personal conflicts faced by the presenter having to investigate a high profile murder case of his boss and a colleague, who were both more than just acquaintances will be discussed.

Conflict of Interest, DNA, High Profile Murder Case

D44 Women as Killers: Are We Missing Something?

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After attending this presentation, attendees will have a better understanding of homicides perpetrated by women.

This presentation will impact the forensic science community by promoting a greater understanding of the efficacy of collaborative working relationships between the professional disciplines involved in criminal investigations.

The public's perception about crime and criminals is often shaped by the vast coverage of this subject on television programs, movies, novels and many other media outlets. The writers and producers may be guided more by ratings than by facts. Homicide investigators are frequently portrayed as individuals with special, often psychic abilities. In reality, we draw upon our own experience, specialized training in forensic and behavioral science and empirically developed information about the characteristics of known offenders.

Professionals who participate in the investigation of violent crime should understand and appreciate the potential evidentiary value of what can be discovered on, in, around and near a victim's body at the crime scene. A thorough crime scene analysis can provide clues to the interaction between the victim and the offender along with the specific chain of events that led to the victim's demise. An experienced crime scene investigator can interpret the physical evidence, often through an analysis of bloodshed at the scene, to propose and test theories of how a crime unfolded, to a reasonable conclusion. The crime scene yields clues not only about the victim and the crime but also about the offender. Media portrayal of offender and associated stereotypical behavior may prejudice investigative analysis. Some may assume that "men murder with guns and knives, while women defend themselves with pots and pans." Public accounts seem, more often than not, to attribute female murderers to more familial settings rather than homicide associated with the male offender. Have some cases remained unsolved because investigators disproportionately focused on men to the exclusion of all available possibilities?

Using specific case examples, the speakers will demonstrate how the investigative focus changed and these complicated cases were resolved. Participants will gain a greater understanding and better appreciate the efficacy of collaborative working relationships between the professional disciplines involved in criminal investigation.

Female Offenders, Crime Scene Reconstruction, Rush to Judgment

D45 Elder Sexual Abuse: What is New in 2010?

Diana K. Faugno, MSN, 1351 Heritage Court, Escondido, CA 92027; Patricia M. Speck, DNSc*, 1740 Overton Park Avenue, Memphis, TN 38112; and Patricia A. Crane, PhD*, University of Texas Medical Branch Galveston, School of Nursing, 301 University Boulevard, Galveston, TX 77555-1029*

After attending this presentation, attendees will be able to list obstacles for elderly women in reporting sexual assault, will be able to identify clinical findings or behaviors that may indicate sexual abuse when there is no disclosure, will be able to describe potential challenges in performing a forensic exam on elderly patients, and will be able to discuss current evidence-based literature and injury patterns that are unique to this group.

This presentation will impact the forensic science community by understanding that elder physical abuse, neglect, and exploitation, including reports of sexual assault and abuse, have risen rapidly over the last decade.

The graying of America population is expected to grow from 4 million in 2000 to 19 million in 2050, mainly due to medical advancements. The true extent of this problem is difficult to determine. Post-menopausal women represent 2.2-6.9 percent of women reporting sexual assault. Reluctance to report sexual abuse, relative isolation of elderly victims, and lack of public and professional awareness undoubtedly contributes to the increasing number of undetected cases of sexual assault in this population. This age group is uniquely physically different when compared to young women and health care providers are not generally familiar with the clinical manifestations of sexual trauma in elderly. There are four things to screen for:

- Being sensitive to observable signs and symptoms associated with sexual assault
- Capacity to consent to sexual activity
- Using appropriate interviewing techniques and questions
- Using more formal assessment tools when needed—Teitlman and Copolillo 2002

This presentation will also include the epidemiology of elder abuse and data from several cities across the U.S. has been analyzed that will be presented as well. Elder women are vulnerable because they are likely to live alone, lack physical size and strength, and are less capable of fleeing or resisting attack as well as lacking in guardianship. Elder women also have an increased chance of sustaining serious injury, increased vaginal or anal tearing and bruising that may never fully heal, brittle pelvis or hip bones can be broken by friction or weight, increased risk of infections and STDs. Evaluation and treatment of sexually abused or assaulted elderly women will be discussed using case vignettes (including history and injury associated with each elderly woman's case) that will assist the medical provider in the application of evidence to nursing practice. Because sexual violence takes away a victim's sense of control, returning and offering control empowers victims. It is important to ask the patient if they want to talk where they would prefer you to sit, how they would like to be addressed (first name or Ms., Mrs., Mr., etc.), and whether they would like someone else present. The healthcare provider must also be aware of cultural/religious differences that will impact the patient. There are also prosecutions and investigative challenges that will need to be addressed: Overcoming the attitude: who in the world would want to have sex with an old person?; preserving testimony – death, illness, sexual assault by family member vs. stranger, getting beyond the generational view points; and, the recanting patient. There are key points to examine:

- Elder abuse is very **underreported**
- Injury is higher due to age and medical conditions that are frequent in the elder population
- Consider what support your courtroom and system has for these elders who cannot sit on the hard benches, etc.
- Special needs if this patient
- Talk slowly ... and have lots of Patience....Patience....Patience

Elder, Sexual Assault, Older Person

D46 Intimate Partner Violence — What Causes Victims to Finally Leave: A Case Study

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After attending this presentation, attendees will have learned how to: identify the phases in this case study from the initiation of a violent relationship to the final decision to leave; describe the steps taken to move from victim to survivor; and, analyze how health care professionals can help victims of intimate partner violence.

This presentation will impact the forensic science community by raising awareness of global communities and healthcare professionals in identifying IPV and responding to the needs of victims of IPV. It is the intent of this case study to identify one survivor's story, by investigating what factors brought an end to her abusive relationship, how she executed this task, what and who were of help to her in making this process successful. This survivor's experiences can convey to the worldwide forensic community, ways to be more pro-active in understanding and assisting individuals living in abusive relationships, recapture their lives, and have productive and meaningful futures.

Intimate partner violence (IPV) is intertwined in the lives of untold numbers of men, women, and children around the world. This human abuse dates back as far as the Roman times, when women were considered property of their husbands. In many ways, this viewpoint continues to hold true for many families today. Between one and two million women are victims of IPV yearly. This occurs at the hands of spouses, boyfriends, ex-spouses, and ex-boyfriends. There are numerous assessment tools available to identify victims and potential victims of IPV. Education in this area is insufficient for health care professionals, which makes it difficult to make the transition from assessment to intervention. Healthy People 2010 has identified violence in relationships as having escalated to a world wide pandemic. Millions of dollars are spent annually on studying the short and long term effects of violent relationships and there are thousands of missed work days lost every year. In order to identify and intervene, regular and consistent risk assessments need to be performed. There needs to be more education for medical and nursing professionals so they are better equipped to identify risk factors and red flags in patients and provide help and resources for victims of violent relationships. Many victims feel there are not adequate resources available in their communities or enough professionals who are willing to get involved. Information is abundant about risk factors, types of abuse, why victims continue to remain in these relationships, and who the abusers often are. However, there is very little literature that identifies what decisive factor occurs in the lives of victims that gives them the courage and strength to sever their ties with their abuser and become survivors.

The purpose of this study is to explore all facets of a single violent relationship and identify the causative elements that evolve which finally bolster the victim's need to leave. This qualitative case study of one will describe one participant's encounter with a violent relationship, identify themes and phases of a violent intimate partner relationship, describe what facilitated leaving, analyze how severing ties from the abuser was accomplished, and discuss how the survivor recaptured her life.

Research questions asked in this case study are: how are women drawn into relationships that are abusive; what impact do violent relationships have on victims emotionally, physically, and socially; how and when do victims realize when enough is enough; and how do they go about severing ties from their abuser? Lastly, realizing this case study of one may have limitations because this is one person's encounter with interpersonal violence and it may not be applicable to all violent relationships, cultures, or age groups.

The intent of this case study of one is to document in rich text, the passage of one victim, who unsuspectingly journeys into the dark world of intimate partner violence. She will identify her reason for severing ties with her abuser, and will reflect on her journey through several phases in her life, to emerge on the other side, into hope, healing, and recapturing her life.

Case Study, Intimate Partner Violence, Severing Relationship Ties

D47 Development of a Forensic Nurse Examiner Training Program at a University Trauma Center

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After attending this presentation, attendees will understand the importance of training forensic nurse examiners at a university trauma center.

This presentation will impact the forensic science community by demonstrating the benefits to patients, law enforcement agencies, and the criminal justice system through the use of forensic nurse examiners in a university trauma center.

The goal of this presentation is to provide an overview of the development of a Forensic Nurse Examiner Training Program at a university trauma center to illustrate the unique contributions of the Forensic Nurse Examiner.

The Forensic Nurse Examiner Training Program is a component of the Clinical Forensic Medicine Program within the Department of Emergency Medicine at the University of Louisville Hospital. The program is comprised of registered nurses who have a broad range of experience and who also specialize in the care of sexual assault victims. With the 2005 requirement of JACHO, the hospital recognized the need for a team of trained healthcare professionals to address the forensic needs of crime victims that present to the trauma center. The program has expanded the knowledge and training of sexual assault nurse examiners by providing the forensic education necessary to attain the position of certified forensic nurse examiner. The program is funded under a contract with the Louisville Metro Police Department.

The programs goals are to provide victims of violent crimes with the highest level of medical and forensic care. The forensic nurse examiners advocate for victims of physical and sexual assault; recognize, document and preserve evidence on victims of assault or other violent crime; provide a specialized trained team of forensic practitioners to address the needs of injured victims of crime; provide clinical forensic training for hospital nurses and physicians; and offer an in-patient clinical forensic medicine consultation service.

The educational program addresses a wide variety of forensic topics including: forensic photography, documentation and interpretation of wounds, adult/adolescent sexual assault, suspect examinations, domestic violence, elder abuse and neglect, felonious assault and blunt force trauma, gunshot wounds, stabbings/sharp force injuries, motor vehicle trauma – driver vs. passenger, airbag induced injuries and hit and run pedestrian incidents, in-custody suicide attempts, police internal affair complaints and excited delirium.

Examinations are currently performed at the request of local, state, and federal law enforcement.

An example of a recent clinical forensic medicine consultation performed by a forensic nurse examiner will be presented.

Case #1: In July of 2009, two brothers were engaged in an argument, which escalated into the brothers drawing knives on each other. As a result, one of the brothers presented to the emergency

department with a stab wound to the chest requiring a pericardial window. This brother stated he was an innocent victim did not admit to having possession of a knife during the altercation. The other brother, being less injured, was questioned, detained and arrested by the investigating domestic violence detective. The detained brother was adamant he was acting in self defense as the other brother came at him with two knives.

The forensic nurse examiner was called to document, evaluate, and interpret the injuries and wounds of both brothers. Examination of the chest wound revealed a vertically oriented single edged stab wound. The injuries to the brother who was detained at the police department revealed multiple superficial incised wounds that supported his statement that the other brother was in possession of a knife.

After the forensic nurse examiner carefully examined both brothers. The forensic nurse, after an examination of the wounds and the clothing, determined that the injuries sustained by the brother who was in custody were consistent with his statements and not consistent with the statements of the brother who said he was an innocent victim.

Based upon the interpretation of the wounds by the forensic nurse examiner, the detective released and dismissed charges against the brother in custody and filed lesser assault charges against the hospitalized brother.

The forensic nurse examiner is an asset to the community and law enforcement. With an accurate forensic analysis by a trained forensic nurse examiner, justice was served. All trauma centers should consider the establishment of a forensic nurse examiner program as a service to victims of violent crime.

Nurse Examiner, Forensic, Training Program

D48 Sexual Child Abuse and Forensic Nursing

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The goals of this presentation are to provide an overview of the development of forensic nursing in Southern Italy and to illustrate the unique contribution of professional nurses in a child abuse center.

This presentation will impact the forensic science community by demonstrating how nurses are utilized within the GIADA project of Pediatric Hospital "Giovanni XXIII" of Bari (Southern Italy).

GIADA Project is a new program implemented in the pediatric hospital. It was established in 2000 by the department of Psychology to address domestic violence and the abuse of women and children. GIADA is a multidisciplinary team effort and in addition to clinical forensic nursing services, includes expertise by psychologists, pediatricians, gynecologists, medical-legal physicians, radiologists, biologists, dentists, and social work services.

Three scenarios will be presented to highlight the contributions of the clinical forensic nurse (CFN) and how this important specialty complements other disciplines in these forensic cases.

Case # 1 – 12-year-old female: A 12-year-old female was brought to the hospital by a CFN from the foster home where she had been living. The girl reported that her "foster grandfather" had been sexually molesting her and that she was experiencing continual pain in her vagina and anal areas.

Case # 2 – 7-year-old female: A 7-year-old girl was brought into the hospital by her mother after she noticed a rash on her genital area as well as a yellow secretion from the vagina. The parents were divorced

and the girl had weekly visits with her father. Her mother suspected that her ex-husband was sexually abusing his daughter.

Case # 3 – 4-year-old female: A 4-year-old female was brought to the hospital by her mother with bleeding in her vagina. Her underwear was stained with blood and was experiencing severe pain in her pelvic region. Her mother reported that she had fallen out of a closet and she injured herself on the corner of the bed. It was immediately clear to the CFN that the patient history did not match the injury and further investigation was necessary.

Conclusion: The clinical forensic nurse continues to be a valuable member of the forensic team often in the position to identify victims of crime immediately. The CFN is essential in starting the chain of events necessary to manage medical evidence, obtain legal documentation and make referrals to the appropriate services.

Clinical Forensic Nursing, Child Abuse, Sexual Abuse

D49 Capacity Building Towards Public Health and Prevention Among Forensic Practitioners

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After attending this presentation, attendees will have an overview of the injury and violence prevention resources.

The presentation will impact the forensic science community by increasing their potential for public health program development and practice related to injury and violence prevention.

Public health practice can benefit from increased participation of medical examiners and other forensic disciplines as they are inherently involved in cases of injury and violence. Preliminary review suggests that medical examiner/coroner offices have limited in-house prevention programs and direct public health service because they may not have the skill set demanded of a prevention practitioner. If so, what can an individual forensic practitioner and other interested medical and public health personnel address capacity building in injury prevention? The goal of this paper is to provide the reader with an overview of the injury and violence prevention resources to increase public health program development and practice.

Forensic practitioners' knowledge of injury process and fatal injury risk factors put them in good stead to be a critical public health partner. With skill-building and better understanding of the opportunities and the resources in injury prevention, they can be valuable in the planning, implementation, and evaluation of preventive programs in the future. With existing resources, they can already promote better mental health for survivors and assist referral or intervention in vulnerable populations or individuals identified from their casework. Since the most crucial data set, fatality data, is essentially death investigation/medical examiner-derived, forensic practitioners should also support and advocate for stronger forensic and public health systems worldwide.

Numerous documents for individual skills and knowledge acquisition as well as system-wide capacity building are provided online and for free. Compendium of best practices, evidence-based recommendations of groups and public health ministries, coalitions up to the international level and United States fatality databases are highly accessible. Long-distance mentoring (MENTOR-VIP) and injury curricula (TEACH-VIP) through the World Health Organization can supplement knowledge as do subscription to free injury newsletters or relevant article listings (i.e., SafetyLit). Memberships in coalitions of injury prevention professionals (STIPDA) or within a specialty (i.e., American Academy of Pediatrics, American Public Health Association–Injury Control and Emergency Health Services) and participation in mailing lists from relevant agencies are additional ways to link with those in injury prevention.

Any additional stakeholders among the medical and public health disciplines are valuable to add to the cause against injury and violence. Knowledge of the ecological model and rigorous evaluation practices allow establishment of risk factors and effective interventions, the cheapest and most significant being primary prevention at a very young age. By being aware of appropriate and evidence-proven interventions, primary (stopping the violence before it takes place), secondary (minimizing harm), and tertiary (rehabilitation of offender and victim) prevention can be achieved.

Greater support, funding and professionalism are encouraged in all the forensic and public health disciplines towards injury prevention work. Awareness of public health through training and continuing education can nurture multi-sectoral thinking in medical examiner/coroner offices and encourage them and their peers in criminal justice among others towards less punitive and more preventative approaches. In death investigation where the standards are variable from either being a coroner or a medical examiner system, conversion to a medical examiner set-up and/or provision of support in either office to conduct research, develop alliances and initiate programs are helpful to increase public health interest.

Capacity Building, Prevention, Public Health

D50 She Loved Him to Death: A Domestic Violence Homicide Case Study

Carrie Costello, BA, Purdue University/Tippecanoe County Coroner's Office, 2408 Temple Court, West, West Lafayette, IN 47906*

After attending this presentation, attendees will have an understanding of the cycle of domestic violence and how this can be applied to male victims of domestic violence. Although studies indicate that 85% – 95% of domestic violence victims are female, this case study will show there are similarities in cases when the male is the victim of the domestic violence. In addition, this case will demonstrate how difficult it is for the victim to end the relationship and escape the domestic violence even when utilizing multiple resources.

This presentation will impact the forensic science community by not only examining the crime scenes themselves, it will also relay the killers behavior before, during, and after the murder as it relates to power and control a batterer has over a victim of domestic violence. This presentation will also impact the forensic community by examining this statistically unusual domestic violence homicide case where the male is the victim his wife is the perpetrator. In addition, discussing the multiple crime scenes and the processing of these scenes, how multiple law enforcement agencies worked together, and the cyber crime forensic experts all supported the prosecution of this offender. Finally, examining the importance of how domestic violence has no boundaries or does it target a specific gender, social economic class, race, or ethnic background.

The primary goal of this presentation is to present a domestic violence case study of a Purdue University married student who was killed by his wife. His body was then dismembered and found in a trunk of a vehicle. The multiple crime scenes, weapons used, and the autopsy findings will be described and illustrated. In addition, the cycle of domestic violence, myths surrounding victims and batterers, and how the police, courts, and Purdue University addressed the domestic violence between the student and his wife that preceded his murder.

In this particular domestic violence case study, the wife's physical abuse of the husband came to the attention of the Purdue University Police Department when she physically assaulted her husband causing him minor injuries. She was arrested; however, there were no formal charges filed by the prosecutor's office. The reason given for the "No File" was the determination of mutual combativeness and how the husband/victim refused to cooperate with the prosecution process.

A few months later, the Purdue University Police responded to the apartment again. Upon their arrival they found that while having sexual intercourse the wife had stabbed the husband in the chest with a knife. She then stabbed herself in the chest and cut her wrist prior to the arrival of the police. The husband and wife were taken to the hospital, for medical treatment, where they recovered. The medical personnel informed the police that the husband's pericardium sack had been nicked by the tip of the knife. The wife was arrested a second time for domestic violence battery related crimes and formal charges of attempted murder were later filed against her.

Although the husband told his wife, on numerous occasions he wanted a divorce, he bonded her out of jail. Within a few months, the wife would violate the protective order. The protective order was adjusted so they could attend marriage counseling together. A short time after the adjustment was made, the husband was reported missing by co-workers.

During this investigation, it was learned that the husband had moved out of his campus apartment and was living with his wife in her apartment in Lafayette, Indiana. There was blood found in that apartment and it was learned that the wife had purchased a gun online and shot her husband in the head. She then dismembered his body, placed it in the trunk of her vehicle and went across the state line. She then boarded an airplane, leaving his body in the trunk of the vehicle which was parked in a parking garage and left the country. Once she reached China, she was stopped due to not having proper documentation to enter the country. She had stolen her husband's passport and pretended to be him in an attempt to flee prosecution. She was later prosecuted in China and is currently on death row.

Domestic Violence, Dismemberment, Homicide

D51 Picking on the Elderly: An Unfair Fight — Elder Abuse and Neglect Through the Death Investigator's Eyes

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After attending this presentation, attendees will be able to identify the risk factors and trends in elder mistreatment; understand the importance of prevention programs; identify possible abuse or neglect related deaths; and, develop methods for prevention. Suggestions for educational resources will be provided to assist in public awareness and prevention.

This presentation will impact the forensic science community by exploring the aging population and the mistreatment elders can succumb to. Emphasis will be placed on identification and prevention methods. Though many elder deaths may be considered "natural" due to their age, the individual and their surroundings must be examined wholly to rule out mistreatment. This includes their current living situation, caregivers, and the individual's own physical and mental abilities. Older individuals usually have fewer support systems, ranging from financial, emotional and physical support, and the impact of abuse and neglect is, subsequently, magnified. This lecture will include several case studies that will highlight common risk factors and key points to consider when investigating elder deaths. Collaboration with outside agencies is an integral part of an abuse and neglect investigation and suggestions into cooperative efforts will be provided. Elder Fatality Review Teams are a collaborative, multi-agency effort to reduce elder abuse or neglect deaths, increase awareness and decrease the incidence of elder abuse, neglect and exploitation. Information regarding initiating an Elder Fatality Review Team will also be explored.

As the aging population grows, so does the amount of Abuse and

Neglect mortality rates. By the year 2030, it is estimated that elders over age 65 will grow to 71.5 million or 20% of the U.S. population. This presentation explores the aging population and the mistreatment they can succumb to. Emphasis will be placed on identification and prevention methods. This lecture will include several case studies that will highlight common risk factors and key points to consider when investigating elder deaths. Collaboration with outside agencies is an integral part of an abuse and neglect investigation and suggestions into cooperative efforts will be provided.

This presentation is recommended for medical personnel, law enforcement, death investigators and individuals working with or caring for the elderly.

Investigation, Elder, Abuse

D52 Use of Dolls in Reenactments in Sudden Unexplained Infant Death Investigations (SUIDI)

Terri O'Shea, MSFS, Harris County Medical Examiner's Office, 7010 Little Redwood Drive, Pasadena, TX 77505*

After attending this presentation, attendees will understand the importance of, and correct use, of dolls in scene reenactments of sudden unexplained infant deaths, the appropriate approach to use with families, the correct dolls to use in various scenarios, the benefits and drawbacks to the different types of dolls, and the photographic documentation needed for the reenactment.

This presentation will impact the forensic science community by creating a better understanding of the scene through doll reenactment and photography, thus providing the forensic pathologist the ability to make more concise evaluations resulting in more accurate determinations of the cause and manner of death.

The ultimate goal is the realization of the benefit in the appropriate use of dolls in reenactments in SUIDI to caregivers, investigators, and to the forensic pathologists.

Following the premises set forth in this presentation will have global implications within the forensic community as well as with those whose lives are touched through doll reenactment within the community. Not only will the investigator gather better information and insight specific to the investigation, but, through proper reenactment techniques, proper use of the correct doll for the scenario, proper photographic documentation, empathy, and compassion, the potential for psychological trauma can be reduced among those involved in reenactment during the investigation of SUIDS. Following these premises, both caregivers and investigators will be more understanding and at ease during the reenactment portion of the investigation. These important factors allow for better documentation of the infant's original placed position as well as the found position, giving the forensic pathologist a more concise understanding of the infant's position in relation to the surrounding physical environment.

The term "Sudden Unexpected Infant Death" is self explanatory in that it describes any infant death that is sudden and unexpected. In the past, most of these deaths were classified under the umbrella of "Sudden Infant Death Syndrome" (SIDS) as the cause of death. Thus, there was often no explanation given for the death. Through investigation techniques including the photographing of doll reenactment, fewer deaths are being classified as an unexplained death syndrome, and more are being determined to be due to suffocation, positional asphyxia or the result of over-lay through co-sleeping.

In 1996, The Center for Disease Control and Prevention (CDC), established guidelines for infant death investigations. They include reenactment of the death scene with the person who found the deceased with photos to assess the sleep environment. These national guidelines should, thus, be incorporated nationally into all sudden and unexpected infant death investigations.

The Harris County Child Fatality Review Board has tracked the mortality rates of infants, documenting a decrease in deaths classified as SIDS from 0.9 per 1000 live births in 1995 to 0.25 per 1000 live births in 2005. The Harris County Medical Examiner's Office (HCMEO) documented a sharp decline in 2000 from 0.6 per 1,000 live births at the beginning of that year to 0.2 per 1000 live births by the beginning of the following year. This significant drop directly correlates to the initiation of the use of dolls in scene investigation reenactments by the investigators from that office. In 2005, HCMEO classified 0.54 SUIDS per 1000 live births as undetermined, 0.1 as asphyxia (over-lay and positional) and 0.27 as actual SIDS. Since that time, the rates of SIDS deaths have continued to decline and the rates of asphyxia from suffocation, positional asphyxia, and co-sleeping over-lays have increased. This is due in large part to a better understanding of the scene through photographic documentation of doll reenactments.

Understanding the best tools and approaches for following these guidelines will allow the investigator to most accurately depict the scene, thus allowing visualization and understanding of the scene for the pathologist. This in turn, yields a more accurate certification of cause and manner of death of the infant. There has been a reluctance to initiate doll reenactments by some forensic death investigators due to the fear of psychological trauma for the caregivers and parents. These fears can be allayed through compassion and the imparting of the information to these people about the importance of the reenactment to the final outcome of the case, as determined by the forensic pathologist.

Reenactment, Dolls, Photography

D53 Forensic Linguistics: An Overview With Emphasis on Questioned Authorship

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The goal of this presentation is to introduce the discipline of forensic linguistics (FL), to present a brief overview of present progress in the field, and to focus in some detail on the practice of one important sub-area of FL - authorship identification.

This presentation will impact the forensic science community by informing attendees of the nature of linguistic analysis and the ways in which it is being applied to forensic questions. It will provide a brief history of FL, specific sub areas of the discipline, including important publications and resources, and the example of linguistic analysis as applied to questioned authorship.

Forensic linguistics is the scientific study of language as applied to forensic ends. With the exception of forensic phonetics, forensic linguistics is a relatively new application of general linguistics and therefore a growing area of modern applied linguistics. While the subareas of FL and their classification are evolving as the field grows, they generally follow given taxonomies for the study of the structure and function of language. Recent research and practice in FL include various forensic analyses of language: *Spoken Language* – auditory and acoustic voice identification, dialect identification, and oral inter-language interpretation; *Written Language* – stylistics and authorship identification, written inter-language translation, legal discourse, product labeling and advertisement, trade marks, legal language, and plagiarism; *Spoken or Written Language* – semantics, pragmatics, discourse analysis, defamation, and jury instructions; and, *Transcribed Language* – transcripts of recorded language, of recorded testimony, perjury, and language of various courtroom participants (e.g., vulnerable witnesses, cross examiners, etc.).

Authorship identification is an important part of FL and is based on the theory and practice of forensic stylistics as a technique that utilizes the linguistic analysis of writing style for the purpose of authorship

identification. Such analysis is known as linguistic stylistics, briefly summarized as follows: *Language* is the internal system human speakers and writers develop and use to communicate. A *dialect* is a variety of language that appears when a particular group of speakers develops consistent patterns (“class characteristics”) of language use. An *idiolect* is a variety of language developed by the individual speaker as a uniquely patterned aggregate of linguistic characteristics (“individual characteristics”) observed in his or her language use. *Linguistics* studies the nature and development of this internal system of language and examines the ways groups and individuals use language in all its communicative contexts. The study of *linguistic variation* identifies linguistic and non-linguistic forces that lead to linguistic diversity among speakers and writers. *Style* is seen as that part of human behavior that reflects individual variation in activities that are otherwise invariant. While style in spoken language is linguistic variation that is directly related to the social context of conversation, style in written language reflects both the writer’s conscious response to the requirements of genre and context as well as the result of his or her unconscious and habituated choices of the grammatical elements acquired through the long term, experiential process of writing. *Written style* is in part, then, the sum of the recurrent choices the writer makes in the writing process. Finally, *stylistics* is a broad approach to the study of style in language, and *linguistic stylistics* is the scientific interpretation of style-variables as observed, described and analyzed in the language of groups and individuals.

It is important to distinguish between linguistic stylistics and document examination. The focus of forensic stylistics is on the consistent, variable, idiosyncratic use of language as such. The focus of forensic document examination is on handwriting, typewriting, computer-generated documents, paper, ink, etc. While there is some overlap between these two fields of inquiry (e.g., typing habits that reflect underlying language patterns), their practitioners find little practical difficulty keeping the two fields separate.

Forensic Linguistics, Stylistics, Questioned Authorship

D54 Lesional Aspects of Cranio Encephalic Injury Caused by an Ax: Two Cases

Jocelyn Pollard, MD, Gilles Tournel, PhD, Sebastien Budes, MD, Cedric Houssaye, MD, Anne Becart-Robert, Valéry Hedouin, PhD, and Didier Gosset, PhD, Institut de Medecine Legale, Faculte de Medecine, Lille, 59045, FRANCE*

After attending this presentation, attendees will have learned about cranio encephalic injuries as a result of ax wounds are not commonly reported in forensic literature.

This presentation will impact the forensic science community by describing the forensic investigations, autopsy, toxicological, and histopathological findings in case presentations. Additionally, forensic investigations, examination of the forensic pathologist, and the neurosurgical intervention are discussed, as well as the value of imaging for the justice in such situations will be presented.

Introduction: Cranio encephalic injuries as a result of ax wounds are not commonly reported in forensic literature. Just like machetes and swords, they are suitable for causing not only soft tissue wounds, but also deep slashes in the underlying bone. On the basis of two cases from Lille, in the northern France, fatal and survived injuries caused by ax are discussed.

Materials and methods: The forensic investigations of the crime scene and woman’s autopsy findings are reported. Another living woman with important cranial lesions caused by an ax was examined by a forensic pathologist. The cranial lesions are described with important iconography.

Results: Case 1: A 50-year-old woman suffered two strokes from

an ax in her home by her neighbor suffering from schizophrenia. The examination revealed a left fronto-parietal fracture and a right temporal wound with achieving the temporal scale and loss of bone substance. It also revealed a right superior frontal contusion, sub arachnoid hemorrhage, sub-dural hematoma, and an extra-dural hematoma of the vertex. Case 2: A 73-year-old woman was hospitalized four months in the aftermath of a stroke. She was back in her home for four days with a left hemiplegia. She was discovered in a wheelchair, dead with a skull fracture. An ax was found on the ground. Body’s examination found numerous lesions on the scalp and right hand with suggestive defense lesions. At the autopsy, a cranial trauma and multiple areas of attrition was identified. The police investigation revealed that the fatal blow had been delivered by her husband, who had then committed suicide.

Discussion: Although an ax is potentially dangerous and widespread in the population, there is no legislation concerning. In forensic literature, the common sites of wounds were the head and the neck. Defense injuries are often associated. Homicide represents one of the leading causes of death, and the head is the target in the majority of cases. Most of the victims were predominantly male, contrary to this case report. The majority of the victims died instantly or within 24 hours. Blunt force is commonly used when the head is the target. Defense wounds, when present, are indicative of the homicidal nature of the attack. And multiple strokes present over the body indicate perpetrator’s determination to end the life of the victim. Finally, the value of imaging for the justice in such situations is discussed.

Ax, Cranio Encephalic Injury, Hemorrhage

D55 Radiological, Forensic, and Anthropological Studies of a Concrete Block Containing Bones: Report of One Case

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The goal of this presentation is to illustrate the potentialities of multislice computed tomography (MSCT) in forensic anthropology.

This presentation will impact the forensic science community by providing an example of forensic anthropological application of the MSCT. Multi-slice computed tomography (MSCT) is uncommonly used in forensic anthropology. This presentation will present a case of MSCT examination of a block of concrete containing bones. This exploration was performed with an anthropological aim in order to analyze the nature and the type of the bones.

Introduction: During demolition work of houses in France, workers found bone fragments at the surface of a concrete block. Local judiciary authorities asked the block to be analyzed. The forensic pathologist was asked many classical forensic and anthropological questions by the police: how many bones or bones’ fragments were present within the block? Were the bones humans or animals?; If human, was it possible to determine the racial phenotype, the sex, the age, and the stature of the deceased?; and, How old were the bones? In order to answer to these questions, a multi disciplinary study of the concrete block and of the bones’ fragments was performed with radiological, forensic,

and anthropology studies.

Material and methods: *Imaging study* — The CT examinations were performed at the Department of Radiology, Hospital of Toulouse, France. The block of concrete approximately 42 * 37 * 17 cm in size was fully scanned with a multisection CT scanner using the following parameters: 120 kV, 200 mAs, 0.75 mm section thickness, and 0.5 mm increments. The images were reconstructed according to both soft-tissue and bone algorithms. The reconstructed spiral CT scans were transferred to a workstation for post processing. Maximum Intensity Projections (MIP) and Volume Rendering Technique (VRT) three-dimensional (3D) reconstructions were obtained. Based on axial CT scans, two-dimensional (2D) coronal and sagittal multiplanar reformatted images (MPR) were performed. The images and 2D and 3D reconstructions were studied by a radiologist also medico-legal anthropologist, prior to the removal of the bones from the concrete block.

Virtual Anthropological Study: To determine if bones were human or animal, medullar index was calculated. The medullar index is defined by the ratio: minimal diameter of the medullar shaft/diameter of the diaphysis at the same level. The major drawback of this technique is the necessity to have relatively well preserved long bone. For humans and anthropoid monkeys the medullar cavity is narrow compared to the transverse diameter of the bone. For human adult, medullar index is on average equal to 0.45; for human foetus, varying from 0.15 to 0.48; for human child, from 0.37 to 0.50. For current domestic animals the index is greater than 0.50: on average 0.55 for pigs, 0.66 for dogs, and 0.75 for chickens. To determine the type of bones, racial phenotype, and sexing the deceased, textbooks of anatomy and anthropology were used. To determine the age of the decedent, measures of lengths of long bones were performed, using classical abacuses and textbooks.

Dry Bones' Anthropological Study: This study was possible after the removal of the bones from the concrete block. The bones were carefully extracted from the block of concrete, guided by the indication of the MSCT using basic hammers and gravers. After complete extraction, the bones were partially restored and analyzed. To determine if bones were human or animal, classical macroscopical criteria used in archeology and anthropology was used. To determine the postmortem interval of these bones, a transversal cut of a well preserved long bone was made and macroscopical analysis of the external and internal walls of the shaft was performed. Furthermore, an ultraviolet-induced fluorescence analysis was performed.

Results: *Anthropological Studies* — In summary, internal and surface bones were identified:

- A mix of human and animal's skeletal remains,
- Identified human bones were:
 - Two sided femur,
 - One left tibia,
 - One left humerus,
 - One left peri acetabular region.

Bones were badly preserved and dramatically damaged with absence of epiphyses or cartilages at their proximal or distal extremities.

Human skeletal remains were consistent with a child, from 8 to 13-years-old, with a minimal stature of 128 cm. Sex and racial phenotype determination were not possible.

The bones were interred in concrete after soft tissues disappeared and no anatomical connexion between different bones was visible. The concrete surrounded the bones, with no free space, in favor of a secondary closed space configuration. Some extremities of the bones had brown trace evocating oil. This evocated a secondary burial: secondary removal of the bones from the first (primary) burial after the complete putrefactive process and entire skeletisation.

The bones dating were evaluated at almost 100 years old by ultraviolet fluorescence.

The main hypothesis for the presence of human skeletal remains

within the concrete was the secondary removal of bones discovered in a primary burial (soil), but not reported, by a previous owner of the house in which bones were found. This phenomenon is quite often encountered in practice.

Discussion: Forensic cases which involved paving materials, required special equipment and technical considerations. Exhumation of a concealed body is always a complex process best handled by a team of experienced death investigators. Use of heavy construction equipment for exhumation, including the pitfall of creating artifactual injury of the body, has been previously described. When the body is encased in paving materials, heavy equipment is necessary for handling the mass and resistance of the material. The effects of body disposal may include preservation of the body and its identifying marks, preservation of trace evidence and toxicology specimens, and the creation of a negative cast of the body. In several cases the cement provided a mold of evidentiary value that could be used to identify the decedent by fingerprints or other means. On the other hand, removing the body from the concrete may cause artifact. The hydration of cement is exothermic. As concrete cures, it may reach temperatures up to 79° for the first few days, resulting accelerated decomposition. After curing is finished the concrete may insulate the body from heat and air. In addition, damp cement is highly alkaline. Thus encasement in concrete may slow decomposition in some circumstances. Decedents encased in cement or mortar may be discovered by chance, following the confession of the perpetrator, through an anonymous tip, or during the investigation of a missing person's report. It is essential to examine the remains under optimum conditions, transporting the heavy cement or concrete blocks to the medical examiner's office for evaluation. This allowed for MSCT exploration to be performed before disturbing the cement encasing the decedent or the bones, as efforts to free them could be directed away from the remains. A multidisciplinary team approach was essential and involved the extensive use of consulting professionals in the disciplines of criminalistics, anthropology, odontology, and radiology. Consultants in the disciplines of anthropology, odontology, and radiology are particularly helpful in establishing the age of the decedent, and the presence of pre-existing trauma. MSCT has also already been used with archaeological purposes. Soil samples containing particular materials have already been studied by MSCT to better characterize its contents. Jansen et al. reported the study of ancient roman glass fragments in situ in blocks of soil. Only one previous report of the application of MSCT in the evaluation of skeleton in soil matrix has been published by Chhem. Contrary to mummies and fossils, studies of ancient skeletal remains do not exist because of the lack of fascination they procured, of their recent and current character. However, MSCT seems to have a potential important role as a non-destructive imaging test for skeletal remains that are embedded in soil or concrete matrix and as diagnostic imaging test for paleopathological lesions and for the detection of burial goods.

The estimation of the PMI of the bones was not possible with the MSCT techniques.

It is the first time, that MSCT is used to study the inner of a concrete block for an anthropological purpose. As presented, this technique is useful for the forensic pathologist and the forensic anthropologist. Dry bone study identified more accurately the type of bones and their sides. This can be explained by the bad conservation state of the bone due to taphonomical processes, concrete erosive action on the bones and the fact that bones were those from an immature subject, more fragile than adult bones. Furthermore, the impossibility of making VRT 3D reconstructions made difficult the surface morphology analysis which can be helpful in such cases. One advantage of the MSCT is the non invasive in situ study, without risk of damage for the bone. In this case, the extraction of the bones was difficult and many bones fractured during their concrete removal. This was due to the vibration of the hammer and the bad state of conservation of the bones.

Conclusion: This study represents an initial attempt to scan skeletal remains that remained embedded in a concrete block in order to prevent disintegration of bones and joints because of their fragility. This approach seems promising and may help in rescuing qualitative and quantitative data that are sometimes irreversibly lost during concrete removal. It is of the utmost importance if one wishes to keep, for example, rare hominid fossils surrounded by calcium rich ground for further study without taking the risk of damaging the original specimen.

Concrete Block, Forensic Anthropology, Multislice Computed Tomography

D56 Analysis of Non-Toxic Ammunition by Double Shot Pyrolysis Gas Chromatography/Mass Spectroscopy (DS-PY GC/MS)

Jeffrey D. Kelly, MS, 2821 Marbella Lane, Dallas, TX 75228; and Jorn C. Yu, PhD, Sam Houston State University, College of Criminal Justice, Box 2525, Huntsville, TX 77341*

After attending this presentation, attendees will understand how pyrolysis can be used in determining qualitative differences in smokeless powder.

This presentation will impact the forensic science community by providing a new testable method for the analysis of lead free ammunition where traditional methods might be lacking.

A Pyrolysis Gas Chromatography Mass Spectroscopy (Py-GC/MS) has been applied to the analysis of trace additive in smokeless gunpowder. The experiment used evolving gas analysis (EGA), single shot pyrolysis (SS-Py), and double shot pyrolysis (DS-Py) to determine the qualitative difference between conventional gunpowder and non-toxic gunpowder. Only 0.28 mg (about three grains of gunpowder) of the sample was needed for the analysis. The organic gunshot residue components, such as ethyl centralite and methyl centralite, which are important markers in determining the presence of gun shot residue, could be detected by double shot pyrolysis. Based on intensities and peak observations, gunpowder additive, such as diphenylamine, methyl/ethyl centralite, dibutyl phthalate, 2 nitro-diphenyl amine, and 4 nitro-diphenyl amine, were different. Differences between manufacturers can be determined. Differentiation between conventional and non toxic ammunition could only be seen in Fiocchi brand ammunition.

Double Shot Pyrolysis, Non Toxic Ammunition, Lead Free

D57 Battery and Abuse in the Elderly: A Review of 100 Cases

Amy Y. Carney, MS, MFS, 16226 Avenida Venusto, #B, San Diego, CA 92128*

After attending this presentation, attendees will have an understanding of the incidence and prevalence of elder abuse, the different types of elder abuse including physical, sexual, and financial, and the types of crimes committed against the elderly in 100 cases prosecuted through the San Diego District Attorney's office.

This presentation will impact the forensic science community by presenting key aspects of elder abuse and the legal issues surrounding it as well as highlighting the need for close collaboration between the nursing, medical, and legal communities.

Awareness of elder abuse is becoming more prevalent as the population of America ages. Since the 1970s when Congressional hearings on elder abuse were held in the United States, more funding and research has focused on elder mistreatment, originally under the umbrella of Family Violence. Multiple aspects of abuse in the elderly have been examined including tools for detection, assessment, and documentation.

Studies have also been done on the circumstances surrounding abuse as well as theories of causation and characteristics of the abuser.

Physical, sexual, and financial abuse of the elderly is being identified and prosecuted at an increasing rate in the California court system. The purpose of this study was to examine the relationship between victims of elder abuse and those convicted of crimes stemming from the abuse.

A review of 100 cases of elder abuse prosecuted through the San Diego District Attorney's Office was done to answer questions regarding relationship between victim and offender, types of abuse, and criminal case outcome. All of the defendants had been convicted of crimes stemming from incidents of elder abuse. The relationship between type of abuse and type of abuser was also examined. Research findings are presented as well as recommendations for further nursing and medical awareness in cases of elder abuse, and cites the need for close collaboration between the medical and legal communities.

Elder, Abuse, Relationship

D58 The Characterization of Heroin Drugs Seized in Taiwan

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After attending this presentation, attendees will gain knowledge on the different regions, seasons, and planting schemes for opium cultivation bringing about basic changes of the ratio of codeine to morphine, so it is practicable to trace back to illicit heroin origins including planting origins, smuggling origins or black market origins.

This presentation will impact the forensic science community by discussing the probative value to determine the origins of different heroin seizures, even if there is no information about real opium planting or possessing origins.

Eighty heroin seizures of over 100 gram in Taiwan during the period of 2006-2008 were analyzed by gas chromatography with a flame ionization detector (GC-FID). In contrast to the methods of trace impurities identification by GC-FID, the ratio of total morphine content to total codeine content were calculated for each heroin seizure. The total morphine content refers to the amount of heroin and morphine related impurities converted back to morphine, and the total codeine content refers to the amount of codeine and 6-acetylcodeine. Different region, season, and planting schemes for opium cultivation bring about basic changes of the ratio of codeine to morphine, so it is practicable to trace back to illicit heroin origins including planting origins, smuggling origins or black market origins. Even if there are no information about real opium planting or possessing origins, the probative value to determine the origins of different heroin seizures is very valuable in suit pending.

Forensic Science, Heroin, Characterization

D59 Death Scene Investigation: The Role of Scene Re-Creation

Kathleen Diebold Hargrave, MA, Saint Charles, Jefferson & Franklin, Medical Examiner's Office, 3556 Caroline Street, Room C305, Saint Louis, MO 63104*

After attending this presentation, attendees shall have a basic understanding of both the mechanics of how, and the need for scene re-creations in the field of death investigation.

Attendees from the forensic science community shall be impacted by factors associated with scene re-creation and how critical it is in determining cause and manner of death in infant death investigations, as

well as, the need to standardize and improve data collected at infant death scenes.

When an infant dies suddenly and unexpectedly after being placed down to sleep, a thorough infant death scene investigation cannot be accomplished without a re-creation of the sleep environment. The re-creation is a critical part of the medicolegal death investigation and is necessary for an accurate certification of cause and manner of death. The CDC's SUID Initiative is aimed at improving the accuracy and consistency of the reporting and classification of SUID deaths. Case examples will be presented demonstrating practical application of the scene recreation technique to be utilized during infant death investigations, as well as, extending this application for investigations of older children and adult deaths.

In 2007, there were 127 sudden, unexpected deaths of infants under the age of one year reported to the Child Fatality Review Program in Missouri. Based on autopsy, investigation and CFRP panel review, 15 were diagnosed as Sudden Infant Death Syndrome (SIDS), 59 Unintentional Suffocation, 25 Illness/Natural Cause, and 23 could not be determined. Four infants were found to be victims of homicide and one infant's death was determined to be an accident, resulting from exposure to excessive heat. Those five deaths are discussed under "Fatal Child Abuse and Neglect."

Of the 127 sudden, unexpected infant deaths in Missouri in 2007, a scene investigation was completed in 122 cases (96%); 60 (49%) of those were completed by a medical examiner or coroner or their investigator.

The SUIDI Reporting Form is one of the many tools available to professionals involved in the investigation and evaluation of all child deaths. The reporting form has been refined and updated over time, and provides a guide to the investigator, regardless of experience level, to consistently collect the information necessary for an accurate determination of the cause and manner of death.

The goals of the SUID Initiative are to develop tools and protocols to: standardize and improve data collected at infant death scenes; promote consistent diagnosis and reporting of cause and manner of death for SUID cases; prevent SUIDs by using improved data to monitor trends and identify those at risk and improve national reporting of SUID.

In some cases, even the most thorough autopsy and scene investigation do not produce a definitive cause of death, in 2007, the cause of death of 23 Missouri infants could not be determined, yet risk factors are present that are significant enough to have possibly contributed to the death. One such risk factor is an unsafe or challenged sleep environment. Recent studies of epidemiological factors associated with sudden unexpected infant deaths, demonstrate that prone sleeping and the presence of soft bedding near the infant's head and face pose very strong environmental challenges, by limiting dispersal of heat or exhaled air in the vast majority of cases. The extent, to which, such environmental challenges play a role in a particular sudden infant death, often cannot be determined. Therefore, a sudden unexpected infant death involving an unsafe sleep environment would be classified as undetermined, when unintentional suffocation is not conclusively demonstrated by the scene investigation.

In conclusion, this presentation will address practical applications on how to incorporate a scene recreation doll as an investigative tool to be utilized during infant death investigations. This tool will enhance an investigator's ability to conduct a thorough infant death scene investigation.

Scene Re-Creation, Infant Death Investigation, SUID

D60 Disaster Victim Identification After Mass Fatality Events: Lessons Learned and Recommendations for Disaster

Response Planning

Megan Bassendale, MSc, MA, 6678 Marine Drive, West Vancouver, BC V7W2S9, CANADA*

After attending this presentation, attendees will understand some of the challenges associated with the Disaster Victim Identification (DVI) aspect of three specific mass fatality incidents, the issues that are common between these events, and the lessons that can be learned from critical comparisons of the DVI response to these incidents.

This presentation will impact the forensic science community by highlighting areas that have been challenging in past DVI efforts and providing recommendations for procedures and protocols that should be incorporated into future disaster response planning in order to better prepare for DVI in the wake of an incident with mass fatalities.

The identification of deceased victims of a disaster is an essential aspect of disaster response. Although disaster response plans usually account for the recovery of a small number of victims in the immediate aftermath of a disaster, identification in the wake of a large-scale disaster can be much more complex and long term. Often disaster response plans do not comprehensively address this aspect despite warnings from experts about the lack of preparedness and useable guidelines to address this issue. Protocols need to be established prior to an event to overcome the challenges and facilitate an organized response to DVI in the aftermath of a mass fatality. These protocols should incorporate lessons learned from earlier events, which thereby necessitates critical comparisons of the response to past mass-fatality events to identify areas for improvement. In the past, a failure to document and learn following mass-fatality disasters has resulted in similar mistakes occurring time and time again, including a lack of appropriate planning for mass fatalities and a lack of operational protocols to address the needs of a mass-fatality situation.

This research was conducted through a comparative analysis of three contemporary incidents that resulted in mass death including: the World Trade Center attack in the United States in 2001, the tsunami disaster in Southeast Asia in 2004, and Hurricane Katrina in 2005, also in the United States. Literature and case studies on the DVI process of each incident was analyzed for specific factors and concepts that were challenging to each in order to develop categories that were common to all three disasters. For the tsunami, research was limited to the experience in Thailand because much of the published research is concentrated on this context; and for Hurricane Katrina, the experience in Louisiana was concentrated on for the same reason. Each of the incidents was analyzed to determine the main issues that were encountered in the DVI aspect of the disaster response. In order to consistently compare the incidents, the data was initially organized according to the number of victims, the breakdown of nationalities represented within the victims and the major issues and/or difficulties in the DVI process. All literature was reviewed using this approach. The data from the three incidents was subsequently compared to identify if there were similar problematic factors across the events. As a result of the analysis, problematic factors experienced by the different events could be categorized into three main fields: planning and preparedness, collection of antemortem data, and identification methodologies.

This research has resulted in key lessons and recommendations in a number of areas for practical actions to improve the capacity of authorities to deal with a mass-fatality situation. These include: (a) consideration of the logistical requirements of the DVI efforts; (b) development of SOP's to guide the process; (c) training of key players in the response efforts; (d) establishment of methods for the creation of an accurate manifest list of deceased individuals; (e) development of a system to track and label information prior to an incident; (f) establishment of guidelines for the collection of relevant, accurate, and standardized antemortem data; (g) access and training in data-

management systems prior to an incident; (h) development of operating protocols and procedures to guide the selection of the most efficient and effective identification technique; and (i) establishment of the details related to DNA analysis prior to an incident. Preparedness in these areas will result in a smoother identification process that will facilitate quicker and more efficient identification and return of human remains to the respective families.

Disaster Victim Identification, Mass Fatality, Disaster Response

D61 Household Furniture Tip-Over Deaths of Young Children

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After attending this presentation, attendees will understand the role of medicolegal death investigations in identifying childhood deaths due to household furniture tip-overs.

This presentation will impact the forensic science community by calling attention to household hazards that may be the cause of preventable childhood deaths.

Although many investigators have recognized that unsafe sleeping conditions such as bed sharing (co-sleeping) and/or compressible sleep surfaces play a causal role in many sudden, unexplained infant deaths, there is a dramatic increase in the incidence of accidental deaths when children reach the developmental stage of mobility. Accidental deaths in childhood result from falls, poisoning, drowning, fires/burns, transportation-related deaths, and deaths due to foreign body inhalation. The majority of these deaths occur in the child's residence, and many result from avoidable hazards in the home and/or lapses in supervision of the children by their caregivers - in some instances because of impairment of the caregivers due to exhaustion or substance abuse. Examples include poisonings resulting from a child having access to household products containing hazardous chemicals or to objects left within the child's reach that could be swallowed, and deaths due to hyperthermia when children are inadvertently left in closed vehicles.

Although the majority of childhood accidental deaths in the home relate to readily recognizable domestic sources of danger such as drowning deaths due to inadequate barrier mechanisms preventing the child from having access to residential swimming pools, other hazards are less well recognized. Childhood deaths due to tip-overs of household furniture or appliances are uncommon. The Consumer Products Safety Commission (CPSC) has warned the public of the potential for injuries and deaths due to pieces of furniture or television sets falling on young children. However, the forensic literature contains little information on childhood deaths resulting from furniture tip-overs.

Cases of nine childhood deaths will be presented that resulted from household accidents in which furniture or domestic appliances fell on the child, to elucidate the causes of death in such rare but potentially preventable circumstances. Three of these deaths resulted from bedroom dressers falling onto a child, one from the tip-over of a kitchen stove, one from a lounge chair, and four from television sets. All but one child was less than five-years-old. The cause of death was attributed to blunt head trauma in three cases and chest and abdominal trauma in one. Four deaths were certified as asphyxia due to chest compression, with the weight of the heavy object impeding the child's breathing. The cause of death in the remaining case was attributed to a combination of asphyxia and blunt head trauma. In all nine cases the death could have been prevented by adequate anchoring of the piece of furniture or by closer supervision of the child.

Childhood deaths due to traumatic asphyxia are uncommon. In

these circumstances, the determination of the cause and manner of death must be based predominately on the investigation of the scene and circumstances of death, since the physical findings at autopsy are few and nonspecific. The medicolegal death investigator, in collaboration with the investigating law enforcement agency, plays a key role in elucidating the cause and manner of death in such cases. Findings indicate that a thorough, multidisciplinary approach correlating the scene investigation with autopsy findings is essential in reducing the incidence of deaths due such domestic hazards.

Tip-Over, Furniture, Childhood

D62 NamUs Human Identification and Reconciliation: Process and Implementation

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After attending this presentation, attendees will understand how the National Missing and Unidentified Persons System (NamUs) can be used in the process of human identification, what types of data can be stored and searched, available forensic services, and how potential matches with missing persons are included/excluded as a case moves towards resolution.

This presentation will impact the forensic science community by defining what the human identification process is for NamUs.

NamUs fills an overwhelming need in the United States for a central reporting system for unidentified human remains and missing person's records. There are as many as 40,000 unidentified decedents and approximately 100,000 missing persons in the United States annually (*The CJIS Link* Vol. 9, No. 3, October 2006, FBI Criminal Justice Information Services Division). NamUs consists of two databases that are fully searchable by law enforcement and majority searchable by the general public, allowing these groups to share information and work together across state and jurisdictional lines to more effectively resolve cases. The two NamUs databases are fully integrated to allow simultaneous searching of the Missing Persons (MP) records against cases in the Unidentified Decedents Database (UP) to locate comparable records and resolve cases.

The definition of the human identification process for purposes of NamUs refers to the reconciliation of antemortem information from missing persons with data derived from unidentified decedents. The reconciliation of data sets includes comparison of intrinsic biological data such as estimated age at death, biological sex, racial affiliation, living stature, known physiologic conditions, and other individualizing characteristics. Extrinsic information includes clothing manufacturer data, shoe size and make, vision prescription, last known address, height and weight from non-medical records such as a driver's license, or other work- issued identification and is also searchable.

Unidentified decedent files entered by medical examiner's and coroner's offices include the physiological or intrinsic characteristics of a person, as well as any available extrinsic factors including the location, search and recovery of the decedent, if recorded. A member of the

NamUs Forensic Team can create a basic biological profile to include a wide range of identifiers and record any and every individuating characteristic for further study. In the case of dental structures, dentures and the like, NamUs forensic odontologists are available to chart the dentition in accordance with accepted practice. Tissue samples for DNA analysis can be prepared following the guidelines established by the University of North Texas Center for Human Identification, at no cost to agencies.

Missing persons files can be entered by families, law enforcement officials and other non-profit agencies and typically contain many basic biological characteristics as well as extrinsic information that is often highly detailed. To ensure accuracy and legitimacy, NamUs Regional Systems Administrators (RSA) review MP cases prior to publication. The NamUs Forensic Services Team coordinates with the RSA to compile detailed information regarding dental and medical records and potential sources of biological reference material. Review of these files by the members of the NamUs Forensic Team results in a written opinion that stored on the NamUs MP file.

Case managers review NamUs-generated potential matches, assessing points of similarity to determine next steps. All forensic services used to include/exclude any potential employ standard forensic methods, procedures and documentation in the course of case comparison. A final reconciliation report is made to the local coroner/medical examiner, justice of the peace and/or law enforcement agency for final evaluation and assessment of "positive identification." These agencies follow conventional practices and legal protocol for official notification to the family and generate the death certificate.

Several cases will be used as examples of how forensic services and the NamUs system have advanced the resolution of MP and UP cases. It is recommended that forensic professionals, medical examiners and coroners and law enforcement become familiar with this powerful and useful new tool that is available nationwide at no charge.

NamUs, Human Identification, Missing Persons

D63 Where Is Your Family Member?: Harris County Medical Examiners Office's Innovative Approach to Locating Next of Kin

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The goal of this presentation is to instruct those attending in the proper methods of locating Next Of Kin (NOK) in an effort to eliminate any NOK discrepancies.

This presentation will impact the forensic science community by providing tools to more effectively locate and notify NOK. The information provided will illustrate the various methods that are critical in conducting accurate NOK searches and demonstrate how each search method is utilized as a part of the thorough investigation of medical-legal cases.

The Harris County Medical Examiner's Office (HCMEO) located in Houston, Texas is the third largest county in the United States and is located on the gulf coastal plain. The county contains the Port of Houston, which is one of the busiest sea ports in the nation, the fourth largest airport system, and the world's largest medical center. Harris County is multicultural and highly diverse with an estimated population of 3.9 million that includes the third largest Hispanic/Mexican American population in the United States. Approximately 400,000 illegal immigrants reside in the city of Houston alone. The homeless population of an estimated 12-14,000 is exceedingly high in comparison to national data. Due to the large population, diverse community, and significant

number of transient residents, it is often difficult and time-consuming to locate NOK. HCMEO has addressed this problem with the formation of the Identification and Tracking Unit and the development of an innovative electronic system that tracks homeless decedents and is used to maintain annual statistics on certain categories of cases. From 2007 through the first six months of 2009, 152 cases of homeless decedents were investigated. From 2004-2006 the average time required to identify a decedent was 23 days. The average time has decreased since 2007 to an average of three days. In 90% of cases NOK are notified of a death within 24 hours of the decedent's arrival to HCMEO.

HCMEO follows the legal order of succession when determining legal NOK as follows: decedent's written directive, legal spouse, common-law spouse, adult children, parents or siblings, and extended family members. This succession is followed to properly identify and locate NOK and to eliminate any NOK discrepancies. When a NOK discrepancy arises, the family is referred to the HCME General Counsel, a Harris County attorney. HCMEO is currently the only medical examiner's office in Texas staffed with an on-site attorney. The attorney reviews written directives and instructs families on how to seek legal counsel via a private attorney if necessary.

HCMEO has established procedures in place to ensure that NOK are notified promptly. Investigators are directed to conduct thorough searches at the scene to obtain any phone numbers, documents or address books containing NOK information. HCMEO accesses public information through the county via birth/death records, marriage licenses, divorce decrees, personal/real property records, various internet searches and criminal history documents. Due to the large influx of immigrants in Harris County, HCMEO consults and seeks assistance from the appropriate consulate on any foreign national. The consulate will verify foreign nationals, locate NOK, and obtain birth records and fingerprints. Public outreach through local, national and international media outlets is accomplished through the Critical Reach program, giving the public an opportunity to assist HCMEO with locating NOK. HCMEO employs three anthropologists who assist with identification of decedents via radiograph comparison. An odontologist provides dental identification consultations when required. Unknown decedent fliers, with photos when appropriate, are distributed through multi-lingual media outlets, consulates, homeless advocacy groups and law enforcement agencies. Law enforcement agencies provide criminal history searches which may include NOK contacts, last known addresses and previous law enforcement encounters. HCMEO works in conjunction with law enforcement agencies by requesting assistance in responding to a last known address to locate NOK and perform death notifications.

Over the years, HCMEO has reached out to the public in a sensitive and respectful manner to locate NOK and confirm decedent identification. In each case HCMEO ensures that the information provided to the public is presented in a sensitive manner out of the respect for the decedents and their families. This innovative process may be modeled at other medical examiner's offices to insure that decedents are properly identified and NOK located expeditiously.

Identification, Scene Investigation, Next of Kin

D64 Bridging the Communication Gap: A Collaboration with the Oakland Police Department Criminalistics Laboratory,

CALICO, and Children's Hospital

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After attending this presentation, attendees will be informed of the benefits of collaboration between scientists, investigators, prosecutors, and children's advocates.

The presentation will impact the forensic science community by providing all parties with the tools to more effectively assess the different needs of the stakeholders involved in crimes committed against children.

The Oakland Police Department Crime Lab has developed an ongoing collaboration with organizations working with child victims of sexual assault. The crime laboratory collaborates with the police investigators, the Oakland Children's Hospital and CALICO – Child Abuse Listening, Interviewing & Coordination Center.

CALICO is a non-profit organization specialized in non-traumatizing and unbiased interviewing methods for child victims of crimes. Members of CALICO include prosecutors, child interviewers, and family service coordinators. Child advocates are also part of the case review process. The doctors and nurses at Children's Hospital document and collect all potential evidence from a child after an alleged assault. Both organizations are often the first contacts for children and their families and are a vital resource during a very stressful time. Collaboration between these groups has been in existence for many years. The crime laboratory was invited to join this group in 2008.

The crime lab's communication with these organizations and the case investigators elucidates our purpose and abilities with regards to the use of physical evidence. This has improved the overall outcome for victims of sexual assault by debunking common myths spread by the media and fictional television. Better communication also ensures potential evidence is not being missed. Likewise, understanding the exam and interview process can help the crime lab understand how they are only one part of a large process.

Communication, Children Victims, Sexual Assault

D65 Ruminations on Competencies, Taxonomies, and Rubrics for Forensic Science Education

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After attending this presentation, attendees will: (1) understand the distinctions among competencies, taxonomies, and rubrics; and (2) how they apply to forensic science in general and forensic science education in particular.

This presentation will impact the forensic science community by improving the educational rigor in forensic science education programs.

The problems inherent in the education and training of forensic science practitioners have been obvious since the advent of forensic science as a profession. The solutions advanced; however, have too often been dictated by considerations of convenience, cost, and control. Three key problems exist: the scientific basis underlying each discipline; the different cognitive decisions required of classification, individuation, individualization, and reconstruction; and the relative roles of academic credentials versus practitioner skills. Addressing these problems needs to begin with the student – what can he do when he meets the teacher, what can he do when he leaves the teacher, and is what he learned what he needs to do the job? This paper will address the use in forensic science education of three educational solutions – competencies, taxonomies, and rubrics – and how they relate to the key problems.

Competencies are the latest arrival on the scene – that combination of knowledge, skills, and abilities in a particular career field, which, when acquired, allows a person to perform a task or function at a specifically defined level of proficiency. It seems straightforward enough that a professional degree program should be designed to provide such a product until one considers two problems: forensic science examinations require logical thinking, creative thinking, and judgment, all difficult to teach and assess; and delineating competencies for forensic science practitioners leads to similar delineations for educators. That is, experience as practitioners and advanced degrees are both required, not one or the other.

Taxonomies were the earliest of the three approaches proposed to professionalize education. The best known of the taxonomies was developed by Bloom; however, it has two deficiencies when it comes to forensic science education. One, it does not distinguish between the two types of applications – technician and professional. Two, it does not include levels for attitude, work ethic, and integrity which are key elements of a desirable forensic scientist. A revision to Bloom's Taxonomy is presented that includes these.

Rubrics were proposed somewhat after taxonomies in an effort to correlate the assessments in a course to the material being taught and to standardize the grading process itself. However, as learned in proficiency testing, when judgment and creativity are involved the concept of assessment may be simple but the execution is complex.

Like many other facets of forensic science, the education and training of a professional practitioner is a complex adaptive system. The three approaches discussed interact among themselves and each will adapt as the field changes. Each of the three approaches has value standing alone but they have even more value in their combination. Competencies describe the desired end product while taxonomies provide the environment within which they are to be achieved and rubrics provide a road map linking the two and insuring that they are achieved. But, their real value lies in their ability for guiding communication for change among the agencies dictating the tasks, the professional associations setting standards for those tasks, and the educational community preparing students to meet those standards.

Forensic Science Education, Judgment Assessment, Standardization

D66 Ethical and Legal Issues of End of Life Between Past and Future in the "Globalized" European Mediterranean Culture: The Italian Experience

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After attending this presentation, attendees will gain knowledge of Italian issues relating to the consent/dissent expressed by the patients (it will briefly explained the judiciary cases of Piergiorgio Welby and Eluana Englaro) or by their relatives. It will also present the legal obligations to act of the medical doctor and the obligation respecting the good life of the patient in the wider context of multi-ethnic society (still in search of true integration) which is now situated on the Mediterranean European basin.

This presentation will impact the forensic science community by exploring the question of the patient consent, which often falls in the understanding or misunderstanding in the case of foreigners.

In the multi-ethnic context that has recently affected the role of the

medical doctors has become particularly complex, because they have to make decisions using professional resources in the best possible way and, in particular, because called upon to perform the role of mediator transforming the social needs of citizens in request for services.

The protection of health is, in fact, the primary objective of any form of welfare but feelings of suspicion, disappointment, and anger begin to arise between medical doctors and patients. The immigration of the last decade into Italy, a traditional cross-road of culture between Europe and Central Asia and between Europe and Africa, has created problems of communication between medical doctor and patient, generating misunderstandings, distrust and error, with consequent increase of denouncements relating to professional liability.

As well known by Italian jurisprudence and doctrine, the lawfulness of the medical act comes from the consensus, defined as a final act of a process that requires adequate information and it is achieved through a good relationship between health professionals and patients, including the relatives. In Italy, the legal basis of the request for informed consent for the patient is governed by Acts 13 and 32 of the Constitution. The lack of explicit consent prevents any type of health care activities and determines very serious consequences especially in the Criminal Code, which states the patient's consent as a precondition to any medical action (act 50 of the Criminal Code). The contemporary age, with its globalization, has made inevitable the need to deal with the major ethical issues raised by contemporary medicine – especially those regarding the end of life – combining with the fundamental truths valid for all religious communities (especially Catholicism, Islam, and Jehovah's Witnesses), which are strongly present in Italy. Therefore, the statement of informed consent as a theory and rule of law appears troubled in these different communities. From the doctrinal point of view, Catholicism has always regarded the medical doctor as a "ministry of life," called to help the living, cure disease, relieve pain. Human life is understood as a gift from God and the patient is seen as a child of God and personification of Christ himself. For these reasons, the crimes against life, such as abortion, homicide, suicide, abandonment of minors, and all forms of violence were ever convicted.

On the contrary, today's Islamic world has a strong heterogeneity of its population, due to movements, currents, and trends that, in the ultramillennarian history of Islam, have crossed the entire Islamic world. This has influenced the thinking and behavior of Muslims, leaving behind traces more or less sustained, being currently in continuous tension between the acceptance of instances and models from the West and the need to safeguard the tradition.

A Muslim doctor is traditionally awarded a paternalistic role in the relationship with the patient and also has the freedom to make the determination if the patient is incapacitated in cases of serious or terminal illness, because the patient is considered severely physically and mortally ill and unable to deliberately end his own life.

The phenomenon of migration from North African countries continues to create problems of communication that tend to weaken the relationship between doctor and patient generating misunderstandings, distrust and consequent medical malpractice.

In conclusion, the authors hope that a policy of full integration between different cultural matrixes is processed in order to achieve a peaceful coexistence between Italian public health and patients, respecting each other's freedom.

Informed Consent, End of Life, Religious Communities

D67 A Cause for Forensic Public Health: Prevention and Public Health in Two United States Forensic Journals

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After attending this presentation, attendees will understand the breadth and depth of prevention literature published by the forensic disciplines as reflected in the articles of two large United States forensic journals.

This presentation will impact the forensic science community by making attendees more aware of injury prevention and other widely available resources.

Interpersonal violence and unintentional injury exact high psychological, medical, and financial toll. Through analysis of 162 papers, literature review and personal interviews, it is found that the forensic community assists public health through data and advice provision and occasional (and rarely published) program implementation.

A full-text Medline search was instituted on January 2009 on two forensic journals (*Journal of Forensic Sciences* and *The American Journal of Forensic Medicine and Pathology*) for the terms "prevention" or "public health." The following data was collected: forensic discipline(s) involved (forensic pathology, forensic psychiatry, forensic sciences, forensic toxicology, jurisprudence/public policy, and criminalistics/criminology); primary author's location and affiliation; injury mechanism or forensic topic discussed; manner of death discussed; relevant public health service provided (provision of risk factors, advice or direct service); and prevention content.

By forensic discipline, the number of articles related to forensic pathology leads by a wide margin (69%) followed by forensic psychiatry (13%) and public policy/jurisprudence (10%). Forensic toxicology, various forensic sciences, and criminalistics/criminology were discussed in 4-7% of the total papers. One odontology and one anthropology article were included in the ten under forensic sciences.

The leading forensic topic was child fatality (18%). Firearms and asphyxia/hanging (14% each), substance abuse (13%), and blunt force injuries (10%) were the leading stand-alone (single modality) mechanisms. Death certification and standards were discussed in 16 or 10% of the papers.

In terms of prevention or public health service, most papers offered risk factor establishment (96 or 59%) or helpful theory/advice (76 or 47%). Only six papers described a direct service and three were jail suicide prevention programs.

Accidents were the most discussed manner of death at 61 papers (37%). Categories of intentional death – homicides and suicides – were mentioned in 19% and 18%, respectively.

Majority of the readership of NAME and AAFS is U.S.-based, thus the North American predominance.

By specific institutional affiliation, medical examiner's offices were the most common source of material (21%) followed by academic forensic departments, and hospital departments of pathology (11% each). As one group, hospitals, hospital departments, medical schools/medical centers produced 36% or more than one-third of the papers. Medical examiners, coroners, and law enforcement groups wrote 23%; government and nongovernmental agencies, 20%; and universities, including academic forensic departments, 19% of the papers, respectively.

Extracted from the articles' prevention content, the following prevention suggestions are found across different manners and causes of death:

1. Limit firearm use
2. Promote mental health
3. Uphold and improve standards in surveillance, reporting and investigation
4. Avoid drugs and alcohol
5. Increase social support of vulnerable groups
6. Support rehabilitative measures in the legal or prison system
7. Decrease environmental risk (through self-protection or behavioral, environmental or product modification)
8. Maintain education, awareness and advocacy of

preventable harm

Any interested parties should consider becoming more aware of their potential for injury prevention and utilize widely available resources. It is hoped that forensic professionals can optimize their knowledge and participation in injury and violence prevention work.

Public Health, Prevention, Forensic Sciences

D68 Association Between Alcohol Dependence and Glutamate Acid Decarboxylase (GAD 67) Gene Polymorphisms in a Male Italian Population

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After attending this presentation, attendees will understand the proposed methodological approach in analysis of biological factors associated with alcohol use disorders.

This presentation will impact the forensic science community by providing novel insights into the biological understanding of alcohol dependence.

Alcohol consumption has been associated with personal, familial, and social problems including school drop-out, productivity losses at work, as well as driving impairment with road accidents. Alcohol consumption has also been considered as one of the major contributing factor in violent crime.

Facing alcohol related problems is highly related to alcohol use disorder prevention and treatment. A contribution to a better understanding of the biological factors associated with alcohol use disorder (abuse and dependence) can be found in genetic studies.

The essential feature of Alcohol Dependence (AD) is a cluster of cognitive, behavioral, and physiological symptoms indicating that the individual continues to use the substance despite significant substance-related problems. In general, the development of AD of alcohol use disorder has been linked to environmental and biological factors. The role of biological factor has been widely published in studies relating gamma aminobutyric acid (GABA) to alcohol use disorder. Acute and chronic effects of ethanol have in fact been linked to a GABAergic system involvement.

Even though many studies have focused attention on GABA A receptor, this study concentrated on the glutamate decarboxylase (GAD), the rate limiting enzyme in GABA synthesis, believing it could be of potential interest in relation to AD development. In particular the isoform GAD 67, responsible for maintaining basal GABA levels as suggested by rodent studies (GAD67 knockout mice is usually lethal) was studied.

Based on these premise, a genetic association study was conducted in a rather homogeneous sample of individuals of Western European origin and of the Veneto Region in Italy, trying to provide novel insights into the biological understanding of the disorder.

Methods: The research has been structured as a case-control study. The patient group included 350 Caucasian males coming from Veneto region, North-east Italy, 140 of whom were alcohol dependent according to the DSM IV TR criteria, and 210 controls recruited from blood donors. Twenty-six SNPs localized in the coding and in the untranslated regions of the GAD 67 gene with a *Genotyping System* were analyzed. Fisher chi-square test for allelic and genotype distributions and Hardy-Weinberg equilibrium (HWE) analysis for cases and controls were performed. Ten SNPs at the GAD67 gene were valid for further statistics.

Preliminary results show a difference in genotype distribution ($p=0.0030$) between alcoholic subjects and controls of SNP rs 11542313

localized in exon 3 of the GAD 67 gene that is responsible for a silent mutation (HIS37HIS).

Discussion: This is the first genetic study regarding GAD 67 gene in relation to the condition of alcohol dependence in an Italian population coming from the same region (Veneto). These results put in evidence a statistical association between one SNP of GAD 67 and the condition of alcohol dependence (AD). In order to clarify the possible meaning of this association, further genetic analysis is being undertaken. In particular, investigation of other genetic polymorphisms both up and down stream from rs 11542313 that could interfere with splicing and/or GAD 67 mRNA stability will be researched.

Alcohol Dependence, Glutamate Decarboxylase, SNPStream

D69 Sex Offender Registration and Public Bias

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After attending this presentation, attendees will understand the need for additional research in the area of sex offender registration along with additional registries concerning the public health safety.

This presentation will impact the forensic science community by discussing that additional research is highly encouraged. It is only with added research that any major impact can happen within the criminal justice/forensic science community. The current study allows the general public to become aware of the current registries that are in place. With future research into this spectrum, adults can become better educated about the world around them. The study also allows for the general public to find out if an offender; whether a sexual offender, drug offender, or an individual with a mental disorder, resides within close proximity.

In recent years there have been many public policy changes that have affected sex offender registration. Many of these changes have come about through significant media coverage of child abductions, molestation, and murders. There is now a mandatory registration for individuals who have been convicted of any sex offense. The objective of this study is to determine if there is a public bias towards having mandatory registration for sex offenders versus other potential mandatory registrations. While sex offender registration has been deemed necessary for public safety there may be other areas of public safety that have been ignored due to the public's zeal towards sex offenders. Areas that are often ignored and just as dangerous to the public's safety or health include weapons, sexually transmitted diseases, mental health diagnoses, and other violent crimes.

The study was conducted through the use of voluntary surveys using both qualitative and quantitative data analysis. The results were evaluated using descriptive statistics to show any potential public bias towards registering sex offenders. Surveys were passed out to the general public ages eighteen to thirty, with no preference towards race, gender, religion, relationship status, and education level. Data was obtained through the University of Colorado as well as through means of public venue.

The results from the survey showed a high percentage of respondents indicating the public's need for additional mandatory registration. Both male and female respondents had a very high percentage of yes responses for mandating sex offender registration. However, both male and female respondents also had a high percentage of yes responses for all weapon registries for the exception of tasers. All respondents had a high percentage of yes responses for other crimes except for illegal drug use. It is important to note that at least 96% of all respondents felt murder should result in mandatory registration. Results from the survey showed the general public ages eighteen to thirty had a bias towards registering sex offenders versus having mandatory registries for other public health safety registries such as gun ownership, HIV

(positive), STDs, illegal drug association, mental illness diagnosis, and hate crimes. Although there is a bias towards registering sex offenders, it is essential to note that a majority of respondents felt there needed to be a mandatory registration for offenders guilty of murder. A large percent of respondents also felt there needed to be a mandatory registration for specific violent crimes and for specific types of weapons. The survey results revealed the need for future research in this area as well as possible changes to current policies and procedures mandating federal registration. The sole purpose of this research study is to provide statistical analysis and to increase knowledge without changing current state and federal policies.

These three words are used throughout the study and used in the surveys which were passed out.

Mandatory in reference to the study means that upon sentencing the offender has to complete the registration in a timely manner regardless of the offender's opinion. As a result of the crime committed, the offender must complete registration in a timely manner. This term is a key component to the survey.

Registration in reference to the study means that the offender must supply their name, current address, convictions or other public health safety, along with date of birth, and a physical description of the offender. Registering an offender into a data base or system provides helpful knowledge to law enforcement and the public.

Crime refers to the offense of which an offender has been convicted; such as statutory rape, first degree murder, and so on. In the study and statistics found, each offender has committed a crime that has ultimately lead to the registration for their offense.

Additional research is highly encouraged. It is only with added research that any major impact can happen within the criminal justice/forensic science community. The current study allows the general public to become aware of the current registries that are in place. With future research into this spectrum, adults can become better educated about the world around them. The study also allows for the general public to find out if an offender; whether a sexual offender, drug offender, or an individual with a mental disorder, resides within close proximity.

Mandatory, Registration, Crime

D70 From Abstract to Publication: The Fate of Research Presented at an Annual Forensic Meeting

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After attending this presentation, attendees will have a better understanding of the fate of abstracts presented at forensic meetings and good predictive factors of publication.

This presentation will impact the forensic science community by emphasizing that publication in a peer-review journal remains the ultimate corroboration of research results.

Introduction: Abstracts presented at scientific meetings is a valuable way of conveying state-of-the-art knowledge and promising techniques, but publication in a peer-review journal remains the ultimate corroboration of research results. Indeed, peer-reviewed publications allow a more rigorous evaluation of the design, methods, results, and conclusions of a paper than abstract acceptance, since conference scientific committees decide on abstract acceptance or refusal based on limited information contained in the abstract itself. A possible measurement of the quality of abstracts presented in scientific meetings is the abstract to publication ratio, representing the proportion of abstracts published in peer-reviewed journals. This ratio has been studied for

several international meetings, ranging from 8.5% to 78%. In forensic sciences, the fate of abstracts presented at international meetings has not yet been evaluated.

Material and Methods: All abstracts of published for the 2006 AAFS Annual Scientific Meeting in Seattle were searched in the PubMed database of the National Library of Medicine for subsequent corresponding published paper in peer-reviewed journals. Papers found on PubMed were closely compared to the proceeding abstracts to confirm correspondence of both. Furthermore, abstracts from three sections of the AAFS meeting, namely engineering sciences, jurisprudence, and questioned documents, were also searched through the FORS Forensic Bibliographic Database. Finally, for all published and unpublished abstracts, the following variables were compiled: section of the meeting, type of presentation (oral/platform or poster), number of authors per abstract and per paper, time span to publication, countries involved, and journal of publication.

Results: For the 58th Annual Scientific Meeting, 623 abstracts were presented at the meeting, from which 102 were subsequently published as a full paper in a peer-review journal. The majority of those papers were published in the meeting's official journal, the Journal of Forensic Sciences (64.7%).

Publication ratio: The overall publication rate was of 16.4%, ranging from 3.4% (for the Jurisprudence Section) to 28.8% (for the Toxicology Section). Although Criminalistics ranked second considering the publication rate (21.8%), in absolute numbers, it published more papers than all other sections (38 papers).

Type of presentation: In general, oral presentations were more likely to be later published than poster presentations, with respective publication ratios of 17.2% and 14.6%. However, this difference was not statistically significant ($p = 0.4219$). The only exception appeared in the Physical Anthropology section, with a statistically significant difference for the publication ratios of oral (18.9%) and poster (3.2%) presentations.

Number of authors: Overall, the average number of authors per abstract was of 2.9. This number of authors per abstract was higher for published abstracts (3.7) compared to unpublished ones (2.7). This difference was statistically significant ($p = 0.0001$).

Time span to publication: The time span to publication averaged 10 ± 9 months. Among the published articles, 13% were published before the AAFS conference, 52% were published within a year and 75% within 1.5 years.

Countries involved and International collaboration: As expected, American authors outnumbered foreigners at this American meeting (USA 76%, other countries 20%, and international collaboration 4%). Publication ratio; however, was highest for abstracts written in international collaboration (37%), followed by abstracts from non-USA authors (21%), whereas U.S. authors presented the lowest publication rate (14%). Statistical analysis revealed a strong association between the geographical source and the publication ratio ($p = 0.0021$; non-USA vs. USA $p = 0.0538$, international collaboration vs. USA $p = 0.0012$).

Conclusion: Forensic scientists are encouraged to publish their findings since abstracts that fail to attain subsequent publication remain valueless in forensic sciences, their data being hardly accessible and of dubious validity due to lack of rigorous peer-review. Since good predictors of publication are a higher number of authors and international collaboration, authors are incited to work in teams, locally and internationally, in order to increase the productivity of research. Research teams must be careful however to avoid gift authorship.

Bibliometry, Meeting Abstracts, Publication Ratio

D71 Analysis of 436 Cases of Sexual Assault

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The goal of this presentation is to describe victim, assailant, assault characteristics, medico-legal findings, and judicial outcomes.

This presentation will impact the forensic science community by establishing a collaboration with gynecologists during the day as is done during the night and weekend in order to improve the multidisciplinary care of victims. Researchers have also proposed the creation of a specific folder for the medical examiners in order to standardize the forensic medical examination for a better assessment of injuries and health status of the victim.

Introduction: Sexual violence now require multidisciplinary medical care, both in order to attempt to collect as quickly as possible the clinical and paraclinical elements that will be useful for justice, and for monitoring medical and psychological care of victims. In Lille, the care of victims is ensured in forensic consultation during the day but also during the night and weekend in collaboration with emergency gynecological and pediatric

Materials and methods: This study was based on 436 examined victims of sexual assault over 15 years established in February 2003 to February 2007 by forensic pathologists. Victims were referred from investigating police authorities. Two groups of victims were defined: a first group of victims examined during the day by a forensic pathologist (247 cases) and a second group of victims examined during the night and weekend by a forensic pathologist and a gynecologist (189 cases). Legal outcomes were obtained from courtroom proceedings.

Results: About 89% of the cases were female victims in the first group and 100% in the second group. Age ranged from 15 to 78 years and the mean age was about 27 years in the two groups. Vulnerability was present in 20% of the cases of the first group and 7% of the second group, including disabled and pregnant victims. There was a single assailant in the majority of the cases for the two groups (about 80%). The assailant was a stranger only in 27% for the first group and 40% for the second group. When the assailant is known, he's a family member in 8% for the first group and 16% for the second group. The victim's home was the most frequent place of sexual assault (38% for the first group and 29% for the second group). Vaginal penetration without condom was the most frequent type of sexual assault in the two groups. The period of medical care was less than two days in 36% for the first group and 94% for the second group. General body trauma was found in 33% of the first group and 44% in the second group. Genital trauma occurred in 16% for the first group and 29% for the second group. About 50% of the cases in the two groups, formal criminal charges were not filed due to insufficient evidence. 24% of the assailants were convicted in the first group, and 21% in the second group.

Discussion: In this study, as in the forensic literature, young, single, and active women are most often assaulted and by a known assailant in the majority of the cases. Sexual assault often occurs in the home of the victim or the assailant. The forensic examination found more damage if it is done shortly after the incident, but the absence of injury does not mean that there was no sexual assault. Concerning the judicial outcomes, the presence of general body and genital trauma were not necessarily associated with conviction. Physical evidence of trauma was neither predictive nor essential for conviction. But victim's examination must be performed as early as possible in order to collect the evidence needed to identify the assailant and initiate preventive treatment. When the time is important in relation to the facts, the care of victims should be a constant concern of medical examiners in order to enable the psychological reconstruction of these victims. Establishing a collaboration with gynecologists during the day as is done during the night and weekend in

order to improve the multidisciplinary care of victims is proposed. The creation of a specific folder for the medical examiners is also proposed in order to standardize the forensic medical examination for a better assessment of injuries and health status of the victim.

Sexual Assault, Adults, Judicial Outcomes

D72 Body Packing as a Forensic and Radiological Challenge: Sensitivity, Specificity, and Accuracy in Detection of Cocaine Drug Containers by Different Modalities

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After attending this presentation, attendees will be able to tell which modality is best for radiological detection of body packs. The difference of body packing, stuffing, or pushing will be elaborated and the varying appearance of the packs in CT and conventional imaging will be demonstrated. Furthering the necessity of a tight collaboration of the custody ward, the forensic institute and the radiology department will be shown.

This presentation will impact the forensic science community by raising awareness of the difficulties in ante mortem imaging of body packers and the organizational problems in custody wards and the upcoming medicolegal issues.

Purpose: The goal of this study was to investigate the diagnostic value of unenhanced multidetector CT (MDCT), plain radiographs and statscan imaging of the abdomen for detection of concealed cocaine – filled packs in the alimentary tract of human transporters.

Materials and methods: Thirty two suspects of drug body packing (29m, 3f, mean age 27y, range 16-45 y) underwent radiological imaging: MDCT (n=14), plain radiograph (n=26) and Lodox (n=8). A total of 57 examinations were investigated (15 MDCTs, 32 plain x-rays, 10 Lodox) whereas some patients had more than one exam, according to clinical or forensic indication. The images were assessed retrospectively by investigators without special training or experience in reading images of drug carriers. Radiological findings were compared with listed evidence in the feces of each detained suspect. Sensitivity, specificity and accuracy for drug concealment were calculated for each modality.

Results: Cocaine-filled containers could be detected in 19 out of 32 patients. Twenty-eight examinations were true positive and nine false negative, whereas 19 were correctly identified as negative, and one was read as false positive. Lodox showed a sensitivity of 57%, specificity of 100 % and accuracy of 70%; plain radiographs 76%, 90%, 81% and MDCT 88%, 100%, 93%, respectively.

Conclusion: MDCT imaging showed the highest diagnostic accuracy and sensitivity in verification of body packing. Based on this fast disposable and reliable result of MDCT and the usually limited space at custody wards, forensic and of course medical issues do lead to an increasing number of (judicial warranted, if needed) MDCT examinations during the last years. Still there is the problem of radiation dose that could be addressed by the application of low-dose protocols for the suspect's benefit. Obviously, the radiologist needs to be well schooled in the appearance of the drug containers in order to diagnose those correctly – therefore a tight collaboration with the custody ward, the associated forensic institute and the radiology department is desirable.

Body Packer, Radiology, Cocaine

D73 Aircraft Accident Investigation and Pilots' Autopsies in General Aviation: A Retrospective Study in France Between 2002 and 2007

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The goal of this presentation is to focus on how far medical aspects are taken in account in fatal air accidents investigations and, subsequently, whether they can or not be considered as a “cause” of accident.

This presentation will impact the forensic science community by showing the interest of improving the postmortem investigations in air crashes in France.

Introduction: The autopsies of pilots killed in an aircraft accidents are performed in the context of judicial investigation. Despite European Recommendation 99-3, the decision to perform or not an autopsy varies from a prosecutor to another. This study focuses on how far medical aspects are taken in account in fatal air accidents investigations and, subsequently, whether they can or not be considered as a “cause” of accident.

Material & Methods: A study conducted by the Institute of Forensic Medicine of Lille (CHRU Lille) on aircraft accidents occurred between 2002 and 2007. Data have been provided by BEA. Occurrences are sorted by probable cause and fatal accidents due to mechanical causes are eliminated. Other causes (i.e., revealing medical issue, loss of control, and unspecified causes) are included. Contents of *postmortem* examinations, autopsies, and toxicological reports are compared to pilots' *antemortem* medical examinations of fitness.

Results: The number of fatal accidents decreases from 51 in 2002 to 39 in 2007, except a spike in 2003 (54). About five fatal accidents per year are related to a medical disease. Nevertheless, a medical impairment as cause of an accident is questionable in 10 cases per year. It was also reported five cases of suicide. Most of the time, heart attack is suspected on the basis of pilot's medical past-history and similarities between the actual occurrence and incidents or serious incidents in which pilots have survived.

Discussion: This study reveals a lack of medical post-crash information related to: (1) the difference of aims between judicial and technical investigation; and (2) the lack of standard practices in forensic examinations. Despite Standard 5.9 of Annex 13 and European Recommendation 99-3, performing an autopsy of a pilot after a crash is not systematic. French civil aviation authorities have notified this difference to International Civil Aviation Organization that could mean a steady state for the next years. Thus, the medical cause is often established when medical findings and abnormal maneuvers are simultaneous. The lack of data can be a starting point for a discussion about the concepts of “*medical cause*” and “*air risk factor*” to initiate an improvement of *postmortem* data collection in air accident investigation.

Autopsy, Aircraft Crash, Pilot



D1 Homicides Mortality Trends in Puerto Rico — 1999-2007

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After attending this presentation, attendees will learn about the trends of homicides in Puerto Rico during the period of 1999 until 2007. The goal of this study is to increase the awareness of the forensic community, law enforcement, and public health agencies about the fatalities in Puerto Rico due to homicides.

This presentation will impact the forensic community by presenting statistical information about the trends and demographics of homicides in Puerto Rico during the first part of the 21st century including the gender difference, age range, and map distribution across the Island.

The Puerto Rico Institute of Forensic Sciences (PRIFS) serves a population of about 3.9 millions citizens. PRIFS was created by the Puerto Rican Legislature in 1985 and merged the Police Department Criminal Laboratory, the Forensic Medicine Institute of Puerto Rico, and the Bureau of Special Investigation's Technical Service Division of the Department of Justice. PRIFS receives all homicide cases for investigation. For this retrospective analysis, descriptive statistics with mortality rates were used age-adjusted to the Puerto Rican population established by the U.S. Census. The population estimate for each year was used to make accurate comparisons. Mortality rates and trends were stratified by sex and age.

For the period under study (1999-2007), 52,122 cases were analyzed of which 7,154 (14%) were classified as homicides. The number of homicides ranged from 729 (2000) to 838 (2004) with an annual average of 788 cases. The annual mortality rate did not have significant changes. The rate of over 19 homicides per 100,000 is the largest in the U.S. and its territories. The mortality rate for men was statistically higher than women with over 35 homicides per 100,000 for men compared to only 2.4 homicides per 100,000 for women (Figure 1). Eighty-five percent (85%) of homicides in Puerto Rico were committed using firearms with multiple shot wounds (semi-automatic and automatic weapons), followed by 6.6% of stab wounds, 5.3% of trauma, and 1.6% strangulation. In all categories, the percentage of men was

higher (>70%), but for strangulation this percentage was similar, 54.3% for men and 45.7% for women.

The homicides were clustered in the age range of 15 to 44 years of age for both genders (Figure 2). The highest accumulation of cases is in the 20-24 years range with a mortality rate of approximately 600 homicides. Men in this age range had an outstanding cumulative mortality rate of 1,200 homicides. For year 2007, the mortality rate for men in the 20-24 years was 122 per 100,000 range and only 4.2 per 100,000 for women.

The distribution of homicides across the Island shows a pattern towards the northern part and San Juan in particular with a rate of over 40 homicides per 100,000.

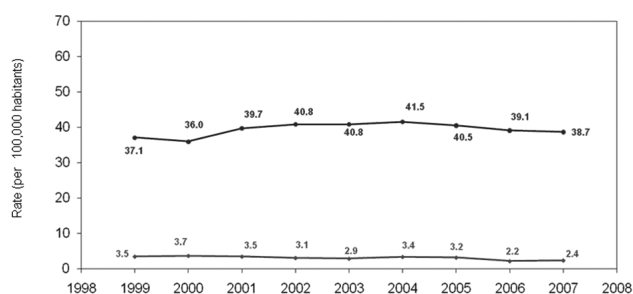


Figure 1. Mortality rate of homicides per gender for the period of 1999-2007 in Puerto Rico.

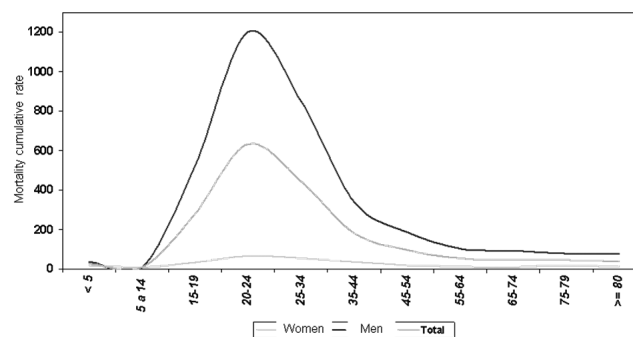


Figure 2. Cumulative homicide mortality rate per gender and age range for the period of 1999-2007 in Puerto Rico.

Homicides, Puerto Rico, Gender

D2 The Changing Role of the Medicolegal Death Investigator Conducting SUID Investigations

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After attending this presentation, attendees will realize how a thorough infant death investigation changed the role of the medicolegal investigator at the Miami Dade Medical Examiner department.

This presentation will impact the forensic community by emphasizing the need for all medicolegal investigators to conduct a thorough investigation to ascertain the entirety of the circumstances surrounding infant deaths and create public awareness of the potential risk factors of unsafe sleep environments.

The Miami-Dade County Medical Examiner Department implemented the Center of Disease Control's (CDC) doll reenactment protocol in February 2007 as a routine component of pediatric death investigations. This change in standard operating procedure for the medicolegal investigator states that all possible Sudden Unexplained Infant Deaths (SUID) must include field-based investigative interviews and doll reenactment with parents and/or caregivers. The caregiver is asked to demonstrate to the investigator the sleep environment in which the infant was last placed and the position in which the infant was found. The requirement of doll reenactments by the CDC has helped the role of the medicolegal investigator to evolve from that of a basic telephone interviewer to an in-field investigator. This change in infant death protocol helps to document unsafe environmental factors such as co-sleeping with companions.

The CDC has found that the decline in Sudden Infant Death Syndrome (SIDS) rates since 1995 has been offset by increasing rates of other types of sudden unexplained infant deaths. A recent review suggests that asphyxia and co-sleeping continue to be significant risk factors in SUID investigations. The new investigative protocol provides photographic and written documentation to inform the forensic pathologist of the first responder's observations, and therefore, provide a more reliable death certification.

Sudden Unexpected Infant Death Investigations (SUIDI) are difficult cases for both families and law enforcement. The doll reenactment is a tool that the investigators can use to depict possible risk factors. Investigators have accepted their new responsibilities to better assist the pathologist with the determination of cause and manner of death. The majority of cases have shown that caregivers are cooperative with the investigation and perform doll re-enactments to provide the details surrounding the terminal event.

Several area hospitals surveyed verified educational materials regarding possible risk factors are provided to new parents. However, hospital staff expressed their concerns regarding that many caregivers failed to follow the current recommendations.

The Miami-Dade Medicolegal Investigators are professionals who are also taking proactive measures by attending educational seminars and maintaining interactions with law enforcement and the public. The strategic plan for the future is to enhance professional standards by providing further education with the use of visual aids as part of the educational information provided to parents/caregivers regarding risk factors and potential causes of injury and death. This service to the public is an attempt to prevent future incidents and decrease the mortality rates of infants in our community.

Medicolegal Investigator, Sudden Infant Unexplained Death Investigation, Doll Re-Enactment

D3 Fatal Unintentional Injuries Among Young Children — A Study From South India

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After attending the presentation, the attendees will identify with the pattern and trend of fatal unintentional injuries in young children in Manipal, South India.

This presentation will impact the forensic community by developing an understanding of the burden of fatal unintentional childhood injuries in the region and to develop preventive strategies so that human lives are saved.

Unintentional childhood injuries constitute a significant public health problem which are vastly preventable. The goal of this study is to describe the pattern and trend of accidental deaths in young children in Manipal, South India. This study is a registry based, descriptive research spanning over a period of 14 years from January 1994 to December 2007. All medicolegal autopsy case records were retrospectively reviewed and cases of fatal unintentional injuries in children aged ten years and below were studied. The information obtained from autopsy reports, police investigations, and toxicological analysis was registered in a database and analyzed. Deaths due to suicidal and homicidal manner were excluded.

During the study period, seventy-five cases of fatal accidental childhood injuries were identified. Males accounted for 68% of cases, with the male-female ratio being 2.1:1. Road traffic fatalities accounted for the greatest number of fatalities (52%), followed by those due to thermal injuries (22.7%). Flame was the cause of thermal injuries in 52.9% cases and fatal scalds were observed in 47.1% cases. Traffic fatalities, falls, and drowning were more common in school age children, while toddlers and pre-school age children were relatively at a greater risk from domestic accidents (thermal injuries and poisoning). The highest number of victims in road traffic incidents were pedestrians (64.1%) and head injuries alone were responsible for fatal outcome in 82.1% cases. The results of the study are compared with studies done elsewhere in India and abroad.

Unintentional childhood injuries constitute a significant public health problem which is vastly preventable. The study highlights on the pattern of accidental fatalities among children in Manipal, South India. To reduce the burden of unintentional childhood mortalities, priorities for school age children are traffic injuries, while for toddlers and pre-school children are thermal injuries.

Morbidity and mortality in children can be prevented by understanding common patterns of injury and educating parents and children about injury prevention. Injury risk can be reduced through injury prevention strategies, child education, and family education. Children should be taught to swim and play safely in and around water, and to stay away from fire and hot fluids. Kerosene lamps should be kept away from children. Enforcement of safety regulations by the state and educating parents about potential household poisons so that such agents are kept in secure places and out of the reach of the child, can help reduce unintentional poisonings. Age-appropriate school-based programs should also be developed to address traffic safety and can go a long way in reducing mortality in children. Although improvement in health services is the aim in management of childhood trauma, and better healthcare facilities definitely bring down the mortality rate, the main emphasis must be on prevention if more lives are to be saved.

Unintentional injuries, Children, South India

D4 Sudden Unexpected Infant Death Scene Investigation – National Training Academies Effect on Death Scene Investigation

Steven C. Clark, PhD, Occupational Research and Assessment, 124 Elm Street, Big Rapids, MI 49307*

After attending this presentation, attendees will be able to identify various SUIDI tools and application technologies, locate "experts" within their region for information and training, and identify the role of each new investigative tool in the proper certification of sudden unexplained infant death. Attendees will also understand how to register as users of the national SUIDI registry.

This presentation will impact the forensic community by demonstrating the performance of medicolegal death scene investigators and their ability to communicate scene findings to forensic pathologists

for more accurate cause and manner of death determinations in SUID cases.

SIDS rates have declined by more than 50% since the early 1990s in large part due to the national Back-to-Sleep campaign to increase the proportion of infants being placed on their backs to sleep. Despite this success, SIDS is still the third leading cause of infant mortality in the U.S. and remains an important public health priority. CDC research has found that the decline in SIDS rates since 1999 is offset (or can be explained) by increasing rates of unknown cause of death and other sudden, unexpected deaths in infancy (SUDI). This finding suggests that death scene investigators, and those certifying cause-of-death on the death certificate, have changed the way they have been investigating and reporting these infant deaths in recent years.

To address this issue of change in reporting, there is a need to: (1) standardize the methods used to conduct infant death scene investigations, (2) standardized the data sets collected from infant death scene investigations, (3) create a method of reporting critical data to the forensic pathologist *prior* to autopsy, and (4) establish methods of translating death scene investigation (DSI) findings into consistent cause and manner of death certifications nationally. Standardizing and improving data collection at infant death scene investigations and national reporting of all sudden, unexplained deaths in infancy (SUDI) including SIDS is a national priority recognized by CDC and supported by the highest level of the U.S. government (Congress).

The Centers for Disease Control and Prevention's (CDC) national effort to standardize and improve the quality of infant death scene investigations through the funding for five SUIDI National Train-the-Trainer Academies will be described. Why standard data collection instrument and training materials are important for improving data collection at the scene, national reporting, and evaluation of data, and how each of these essential elements for the prevention of sudden, unexpected infant deaths will be explained. Moreover, the benefits of the new reporting form, electronic reporting system, and training materials for medical examiner/coroner investigators who conduct infant death scene investigations will be explained.

Finally, the presentation will introduce medical examiners and coroners to investigative tools that will enhance their ability to conduct a thorough infant death scene investigation. Namely, the utility of the Sudden, Unexpected Infant Death Investigation Report Form (SUIDIRF), and the new electronic national registry for reporting SUIDI data, and associated training materials will be demonstrated. The training materials will be available in several formats including web-based training, DVD, VHS, CD-ROM, and in-class training manuals.

Infant Death Investigation, SUID, SUIDI National Academies

D5 A Typology of Voluntary Assault and Battery Upon Children Under the Age of 15 and Factors Associated With the More Severe Cases: A Three-Year Retrospective Study in a Lyon University Hospital, France

Géraldine Maujean, MD, Laurent Fanton, MD, Hervé Fabrizi, MD, and Daniel Malicier, Institut de Médecine Légale, 12 Avenue Rockefeller, Lyon, 69008, FRANCE*

After attending this presentation, attendees will become aware of a particular type of physical violence perpetrated against children in the last three years in the third largest French town.

This presentation will impact the forensic science community by pointing out the factors associated with the more severe cases of voluntary assault and battery upon children under the age of 15.

Objectives: The United Nations Children's Fund research has recently estimated that almost 3,500 children under the age of 15 die

from physical abuse and neglect every year in the industrialized world; the greatest risk being among younger children. According to the National Observatory on Social Decentralized Action, almost 19,000 children experienced either physical or psychological violence in 2006 in France. As the only systematically collected data in legal proceedings concerning violence perpetrated in the family, such statistics were biased and much of the violence against children remained under-recorded. A retrospective study was conducted over three years in Edouard Herriot's Hospital in Lyon, France, to describe voluntary assault and battery upon children under the age of 15 and to investigate the factors associated with the more severe cases.

Methods: All children under the age of 15 who were examined in the forensic consultation for voluntary physical or psychological assault and battery between January, 1 2005 and December 31, 2007 were retrospectively included. All victims of sexual assault were excluded. For each case, demographic characteristics, aggression history, medical, and forensic data were collected from medical records according to a standardized data collection form. Victims were classified as severe if the injury prevented normal daily activity for more than eight days. Severe cases were compared to mild cases using Chi2 or non-parametric tests. Multivariate logistic regression was used for risk factors' identification. Statistical analyses were performed with SPSS for Windows, version 12.0.

Results: Among the 193 children included (62.2% male, median age of 8.0, range 0.5 to 15), 34 (17.6%) severe cases were reported. The average number of days being prevented from daily activity was 4.75 (range 0 to 45).

Factors independently associated with a severe case after multiple logistic regression were:

- Separated or divorced parents (OR=0.27; IC95% 0.07-1.01; p=0.05)
- Children attending school (OR=0.07; IC95% 0.01-0.44; p<0.01)
- Non-family young offender under the age of 18 (OR=14.2; IC95% 3; 6.7; p<0.01)
- Aggression at home (OR=0.19; IC95% 0.04-0.95; p=0.04)
- Punched or kicked children (OR=0.09; IC95% 0.02-0.46; p<0.01)
- Traumatic wound (OR=18.3; IC95% 2.16-154.7; p<0.01)
- Arm wound (OR=3.9; IC95% 1.07-14.1; p=0.04)

Conclusion: Differences between severe and mild case characteristics exist wherever sociological or aggression-related factors are considered. The lower proportion of severe injuries perpetrated at the young victim's home may reflect most physical violence against children in the family, which usually does not cause serious visible physical injury and often requires repeated incidents to allow community-based or legal interventions. Non-family, young offenders under the age of 18 and victims not attending school are two significant factors associated with severe cases. These results first illustrate youth violence which has dramatically increased worldwide in the last two decades without being confined to any one subgroup of the youth population. Finally, this study underlines the importance of schooling and school quality to prevent such kind of violence.

Physical Violence, Child, Risk Factors

D6 Household Furniture Tip-Over Deaths of Young Children

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After attending this presentation, attendees will understand the role of medicolegal death investigations in identifying childhood deaths due to household furniture tip-overs.

This presentation will impact the forensic community by calling attention to household hazards that may be the cause of preventable childhood deaths.

Although many investigators have recognized that unsafe sleeping conditions such as bed sharing (co-sleeping) and/or compressible sleep surfaces play a causal role in many sudden, unexplained infant deaths, there is a dramatic increase in the incidence of accidental deaths when children reach the developmental stage of mobility. Accidental deaths in childhood result from falls, poisoning, drowning, fires/burns, transportation-related deaths, and deaths due to foreign body inhalation. The majority of these deaths occur in the child's residence, and many result from avoidable hazards in the home and/or lapses in supervision of the children by their caregivers, in some instances because of impairment of the caregivers due to exhaustion or substance abuse. Examples include poisonings resulting from a child having access to household products containing hazardous chemicals, or to objects left within the child's reach that could be swallowed, and deaths due to hyperthermia when children are inadvertently left in closed vehicles.

Although the majority of childhood accidental deaths in the home relate to readily recognizable domestic sources of danger such as drowning deaths due to inadequate barrier mechanisms preventing the child from having access to residential swimming pools, other hazards are less well recognized. Childhood deaths due to tip-overs of household furniture or appliances are uncommon. The Consumer Products Safety Commission (CPSC) has warned the public of the potential for injuries and deaths due to pieces of furniture or television sets falling on young children. However, the forensic literature contains little information on childhood deaths resulting from furniture tip-overs.

Nine childhood deaths that resulted from household accidents in which furniture or domestics appliances fell on the child will be presented to elucidate the causes of death in such rare but potentially preventable circumstances. Three of these deaths resulted from bedroom dressers falling onto a child, one from the tip-over of a kitchen stove, one from a lounge chair, and four from television sets. All but one child was less than five years old. The cause of death was attributed to blunt head trauma in three cases and chest and abdominal trauma in one. Four deaths were certified as asphyxia due to chest compression, with the weight of the heavy object impeding the child's breathing. The cause of death in the remaining case was attributed to a combination of asphyxia and blunt head trauma. In all nine cases the death could have been prevented by adequate anchoring of the piece of furniture or by closer supervision of the child.

Childhood deaths due to traumatic asphyxia are uncommon. In these circumstances, the determination of the cause and manner of death must be based predominately on the investigation of the scene and circumstances of death, since the physical findings at autopsy are few and nonspecific. The medicolegal death investigator, in collaboration with the investigating law enforcement agency, plays a key role in elucidating the cause and manner of death in such cases. These findings indicate that a thorough, multidisciplinary approach correlating the scene investigation with autopsy findings is essential in reducing the incidence of deaths due such domestic hazards.

Death, Child, Furniture

D7 Experiential Learning: An Effective Method of Training for Radiographers Involved in Mass Fatality Incidents?

Kim E. Hutchings, MSc, Inforce Foundation, DCMS, Cranfield Forensic Institute, Cranfield University, Shrivvenham, SN6 8LA, UNITED KINGDOM; Mark D. Viner, MSc*, Inforce Foundation, Forensic Science Institute, Cranfield University, Royal Military College of Science, Shrivvenham, UNITED KINGDOM; and Roland Wessling, MSc, Inforce Foundation, Cranfield University, Cranfield Forensic Institute, Shrivvenham, SN6 8LA, UNITED KINGDOM*

After attending this presentation, attendees will understand the value of experiential learning through the use of simulation exercises in the training of mass fatality responders. Attendees will learn how the creation of scenarios that replicate the elements of mass fatality incidents enable students to develop the necessary skills in a controlled and educational environment.

This presentation will impact the forensic community by highlighting the role and contribution of radiography in mass fatality investigations and demonstrating the value of simulation exercises in training forensic professionals to respond to mass fatality incidents.

Method: Typically radiographers (radiologic technologists) work in safe, controlled environments with other professionals who understand radiology, radiation science, and the contribution of imaging to medical investigation. In a mass fatality incident this will not be the case; the situation will be unfamiliar and traumatic. The radiographer will need to act with confidence and speed and be mindful of the situation unfolding around them. They may be the only imaging professional in the team. The use of simulation training in a true multidisciplinary team environment helps the radiographer to gain firsthand experience of a realistic mass fatality situation, to plan and to understand the implications and limitations of their actions, and develop the necessary skills for disaster response within a controlled environment. By creating a simulated mass fatality incident in which all the elements of emergency forensic response are represented, students can experience firsthand the multifaceted challenges presented by such a situation. Students can develop and try out their own strategies for overcoming practical and organizational challenges in a learning environment, supported by a team of experienced tutors. By use of multidisciplinary training exercises, students gain understanding of the challenges faced by other professionals and learn to adopt a team approach to solving practical problems to achieve a common objective.

Results: Students learn to:

- Understand the scope of a mass fatality incident
- Adapt to changing circumstances
- Develop the confidence to work as the sole radiation expert in the team
- Contribute effectively to the team
- Establish their own x-ray facility
- Have consideration for the safety of self and others
- Undertake a radiation safety survey and train others in radiation safety
- Participate in the identification process.

Conclusion: There is no way to prepare adequately for a mass fatality incident as each and every incident will be different. However such simulation exercises assist students to prepare for, and adapt to, any situation as it unfolds, and to act professionally and confidently as part of a multidisciplinary team.

Mass Fatality, Forensic Radiography, Simulation Training

D8 Comparison of Differential Processing Techniques for Development of Latent Prints on Porous Substrates

Marissa Olvera, BA, BS*, 3203 Park Avenue Apartment C, Richmond, VA 23221

After attending this presentation, attendees will become more informed regarding the performance of Oil Red O as a latent print processing reagent.

This presentation will impact the forensic community by providing additional instruction and information in the maximum development of latent prints.

Friction ridge skin forms on the hands and feet of a fetus in utero and the pattern produced is permanent unless altered as a result of injury or disease. The orientation, location, and relationship of ridge characteristics allow for individualization or exclusion of a fingerprint to its source. An impression of the friction ridge pattern can be transferred during contact with a surface, resulting in a latent print, if invisible to the naked eye.^[1] Validation of the use of ORO in the development of latent prints on paper substrates, integration of ORO in sequence with other methods of fingerprint development and carrier solvent examination are important areas of research in latent print analysis. Investigation and optimization of the techniques used for the visualization of latent prints are essential to the successful contribution of latent print analysis in forensic science.

Latent fingerprints are typically composed of varying amounts of salts, amino acids, fats, oils, and waxes. Routine chemical processing techniques in the development of the water-soluble, amino acid component of latent fingerprints include DFO (1,8-diazafluoren-9-one) and ninhydrin (triketo-hydrindene hydrate).^[2] The lipid components of latent fingerprints are routinely processed via Physical Developer (PD).^[3] The use of Oil Red O (ORO), a lipophilic stain, has been established as being effective in the development of latent prints on paper substrates and as a possible replacement for Physical Developer (PD). Oil Red O (ORO) was evaluated as a latent fingerprint reagent on various paper substrates in comparison to PD and in sequence with DFO, 1, 2-IND and NIN. Performance of 1, 2-IND in contrast with DFO was also assessed. Amino acid based and sebaceous based fingerprints were deposited on nine paper substrates including book paper, sticky notes, brown paper, manila envelope, newspaper, notebook paper, copy paper, cardboard, and check paper. Upon development, each fingerprint was paired with its original partner and visually compared to determine the effect of carrier solvent on sebaceous print development. All comparisons were verified by a qualified latent print examiner at the Oregon State Police Forensic Services Division, Springfield. ORO was found to develop more latent fingerprints of better quality than PD solo and in sequence with other latent fingerprint reagents. 1, 2-IND was observed to have a positive effect on ORO development when used as a replacement for DFO. HFE-7100 was utilized as the carrier solvent for DFO, 1, 2-IND, and NIN as it was demonstrated that fewer fingerprints developed using PD. It is recommended that ORO should be used as a latent fingerprint reagent using the parameters described, in place of PD. HFE-7100 should be used in lieu of PD as the carrier solvents for amino acid based latent print reagents, DFO, 1, 2-IND, and NIN. When utilizing ORO for latent print processing, it is also recommended that 1, 2-IND should be used in place of DFO.

References:

1. Cowger, J. *Friction Ridge Skin: Comparison and Identification of Fingerprints*; CRC Press: Boca Raton, FL, 1993.
2. Wallace-Kunkel, C.; Roux, C.; Lennard, C.; Stoilovic, M. The Detection and Enhancement of Latent Fingermarks on Porous Surfaces-A Survey. *J. For. Ident.* **2004**, *54*(6), 687-705.

3. Hollars, M.L.; Schwartz, R.L.; Trozz T.A. *Processing Guide for Developing Latent Prints*, Federal Bureau of Investigation: Washington, DC, 2001.

Oil Red O, Latent Prints, HFE-7100

D9 Oral Forensic Photography Protocol

Patricia A. Crane, PhD*, University of Texas Medical Branch Galveston, School of Nursing, 301 University Boulevard, Galveston, TX 77555-1029; and Diana Faugno, MSN*, 1351 Heritage Court, Escondido, CA 92027

The goals of this presentation are to demonstrate patient positions to maximize quality of oral images, explain storyboard images of oral photographs and to provide rationale for images and the value of each position.

This presentation will impact the forensic community by demonstrating how penetration of the oral cavity with patient reports of sexual assault requires a unique clinician skill set and unique techniques of photography to provide valuable evidentiary photographs of the oral findings.

Forensic photography requires special skill and techniques when a patient reporting sexual assault discloses oral penetration. Oral images are of great value especially if the patient is not able to provide the history of the event, has no memory of the event, and there were no witnesses. For the sexual assault examiner, photography may also include images of the body and images of the oral and genital area looking for injury, no injury, or evidence of pre-existing medical conditions for documentation. Photography allows sexual assault examiners to add images for enhanced documentation and the opportunity to consult and teach in a peer review setting. Defense experts are also able to view the findings and provide valuable consultation in these criminal or civil cases.

This presentation will focus on providing a guideline or protocol that can guide the sexual assault examiner, or other clinician, through the process of obtaining the highest quality of oral images possible.

The sexual assault examiner typically performs a forensic medical examination, including subjective and objective assessment, and documents the physical findings. Forensic aspects of care require that the examiner provide documentation of injury or no injury for the record. Documentation is provided in written form, diagrams, and photographic images.

A pictorial presentation of the photographic protocol in this presentation will assist sexual assault examiners with providing the highest quality oral examination with patients reporting oral penetration with sexual assault. Such a protocol will assist the examiner in obtaining maximum value from the oral examination and images in order to have complete high quality evidence following a medical forensic examination.

The trend toward digital photography with the magnification software provides extreme detail for all parts of the oral cavity. This is critical in order for the examiner to be able to identify the micro trauma that is typical of sexual assault, including oral penetration. Magnification plays a major role in determining the size of the depth of field range. Patient and clinician positioning for long-range, medium-range, and close-range images will be demonstrated for obtaining the best images of external lips, mouth, soft and hard palates, and other oral anatomical sites. Comparison of images with explanations will be provided to explain to participants the rationale for assuring that images meet the criteria for best quality images for use as evidence in legal proceedings. The expected criteria for high quality images that are expected in the courtroom include: (1) picture is in focus, (2) picture is not too light or too dark, (3) picture is aligned and not twisted, (4) picture truly represents the subject matter, (5) picture is not compressed too

much, and (6) picture has adequate image resolution to visualize what is necessary.

Examples and several images similar in subject matter will be displayed for the participant's visualization of the difference in resolution and quality of picture. The participant will be able to observe and compare the quality of images and apply the information to their own sexual assault practice.

Oral Photography, Sexual Assault, Forensic Imaging Documentation

D10 Molecular Palynology Study in Central East Texas: A New Approach to Linking Crime Scenes

Jamie L. Jouett, BS, Sam Houston State University, 13 FM 1696 E, Huntsville, TX 77320*

After attending this presentation, attendees will see how molecular palynology in combination with a Geographical Information Systems (GIS)-based analysis may help to link pollen samples collected at a crime scene to or from a suspect with a particular geographic area and the associated vegetation.

This presentation will impact the forensic community by demonstrating a correlation between STR (Short Tandem Repeat) analysis of pollen/plant DNA and geographical location to potentially link pollen evidence to a crime scene.

Forensic palynology is gradually becoming a more recognized scientific field as the analytical technology has developed to the point that trace evidence, such as pollen collected from a crime scene or suspect, can be characterized efficiently. Pollen evidence has been successfully used in the past to solve criminal cases; however, no initiative has been taken to merge hi-tech analytical techniques and mapping programs such as GIS with DNA analysis. Similar to humans, plants and pollen are comprised of DNA. STR analysis of plant and pollen evidence could provide the missing link, which allows differentiation among pollen evidence, in turn, narrowing the window of searching to either include or exclude geographical areas from the scope of a criminal investigation.

The objective of this study is to demonstrate how pollen collected at a crime scene or from a suspect can be linked to a geographical location by STR analysis and sequencing samples of pollen DNA. A wide range of pollen samples were collected from the northern, southern, eastern, western, and central areas of Huntsville, TX. This presentation illustrates geographical profiling by mapping the Huntsville area and associated vegetation using GIS software. In addition, a new molecular approach involving STR analysis of DNA was performed on each collected pollen sample. These were compared to reference samples to identify a species and subsequently link the pollen sample back to a plant source. The steps in this method involve DNA extraction, amplification by PCR, and detection by STR analysis. In doing so, specific pollen from a native plant species is characterized by establishing a unique DNA profile.

The ultimate goal of this study is to increase the availability of pollen data and stress the significance of pollen collection at crime scenes. Thus, by broadening the knowledge of forensic scientists, further opportunities, initiatives, and new methodologies and advancements in the forensic palynology field will be realized. Most importantly, the study and ideas presented here provide a basis for STR analysis of pollen DNA and will subsequently benefit forensic scientists in criminal investigations involving pollen/plant evidence. Moreover, the application and software described above will set the benchmark for generating a database combining pollen DNA profiles with geographical locations.

Palynology, Short Tandem Repeat (STR), Geographical Information Systems (GIS)

D11 Evaluation of a Prototype Field Deployable Device for Rapid Acoustic Analysis of Liquids and Contraband in Opaque Containers

Cheryl L. Brophy, BS, Federal Bureau of Investigation, Counterterrorism Forensic Science Research Unit (CFSRU), 2001 Investigation Parkway, Quantico, VA 22135; Morgan A. Turano, MALS, 71 Spy Pond Lane, Arlington, MA 02474; Aaron A. Diaz, BS, Pacific Northwest National Laboratory, 902 Battelle Boulevard, Richland, WA 99352; and Brian A. Eckenrode, PhD, Federal Bureau of Investigation, CFSRU, Building 12, Quantico, VA 22135*

After attending this presentation, attendees will learn of a prototype device that is being tested for its ability to be deployed in the field for acoustic, non-invasive analysis of containers of varying sizes and the ability to detect contraband.

This presentation will impact the forensic community by optimizing acoustic field devices used to acquire safe, rapid, and accurate data from containers which will prevent dangerous or illicit substances from penetrating transportation networks and border entry sites.

In the ongoing efforts of the Federal Bureau of Investigation to characterize and block terrorist threats to multi-modal and air transport systems of the United States, research has been accomplished to generate a field deployable device which acoustically interrogates containers of various sizes and material composition, and responds with quick, real-time identification of potential threat liquids and/or contraband.

The beta version of this portable device has been evaluated for performance via examination of ultrasonic time-of-flight measurements, attenuation responses, comparative studies of liquid and dry transducer couplants, and the device's ability to discern the presence of foreign bodies hidden in containers. Upon determination of the operational stability of this prototype device, a goal is to be one step closer to bringing a non-invasive, user friendly instrument to the field that will provide quick assessment of threat liquids and/or contraband, without the concerns associated with destructive or discharging methods.

The protocol by which the device was evaluated included use of containers fabricated from five materials found in the "stream-of-commerce". Three sizes of each of the five container wall types were employed, to vary diameter and thus the acoustic time-of-flight responses within the same liquid type. Four commercially available liquids were used to determine if the instrument would identify the contents and respond with velocities and attenuations that could be compared to literature values and/or to independently measured baseline values.

A Phase I study was completed and results indicated that improvement was achieved by changing the transducer couplant material from wet to dry mode, such that all RSD's for velocity responses were less than 1%. Additionally, the transducer dry couplant material was found to be more robust with daily, consistent use. It was discovered that improvements in the area of distance acquisition from caliper readings were necessary for this prototype, and such improvements have already been implemented in a currently designed bench top analog at PNNL. Phase II studies will include expanding the database for precursor and threat liquids. Obstruction analysis was also performed using various materials, of varying shapes and sizes, placed within each container type and liquid type, as previously described.

It is the intent of this evaluation to assist those interested in deploying an acoustic field device to reach the goal of acquiring safe, rapid, and accurate data which will help prevent dangerous or illicit substances from penetrating transportation networks and border sites. Insights will also provide direction for a Phase II evaluation/modification of the device.

Ultrasonic, Acoustic, Liquid

D12 VICTIMS: A National Database Solution for Unidentified Human Remains in the United States

Philip N. Williams, BS, Federal Bureau of Investigation Laboratory, CFSRU, Building 12, Quantico, VA 22135; Lisa Bailey, BA, Federal Bureau of Investigation Laboratory, 2501 Investigation Parkway, SPU/Room 1115, Quantico, VA 22135; and Melissa A. Torpey, MS, Federal Bureau of Investigation Counterterrorism and Forensic Science Research Unit, Federal Bureau of Investigation Laboratory, CFSRU, Federal Bureau of Investigation Academy, Building 12, Quantico, VA 22135*

After attending this presentation, attendees will become aware of the existence and usefulness of the FBI VICTIMS software system. In addition this presentation should promote the use of the VICTIMS system as a forensic tool for identifying unidentified human remains.

This presentation will impact the forensic community and the public by demonstrating how VICTIMS will create an environment capable of assisting a variety of forensic professionals in melding their data for the analytical comparison between missing persons and unidentified human remains records, as well as an environment where friends and families of missing persons can easily search all of the unidentified records in the United States for their loved one in the pursuit of making an identification.

After attending this presentation, attendees will learn more about how they and their agencies can contribute to the VICTIMS (Victim Information, Catalog, Tracking, and IMage System) database, how to enter and maintain their unidentified records within the VICTIM System, and the benefits of utilizing VICTIMS. Currently in its final phase of development, the VICTIMS software is designed to remedy a number of problems with existing approaches to solving cases of unidentified human remains. The goal of VICTIMS is to provide a national database of unidentified human remains that will organize and coordinate the efforts of the forensic identification community and the public.

Records of unidentified human remains cases have been available on the FBI website since its inception. However, these records were neither comprehensive nor searchable. As a result, in 1998, the FBI Laboratory embarked on a focused effort to solve the increasing number of cases involving unidentified human remains. While the FBI has made improvements in a number of forensic fields (DNA, facial reconstruction, etc), these improvements have largely been conducted in isolation within the specific fields in which they apply. In order to bridge the gap between the various forensic disciplines that assist with the identification of unidentified human remains, a centralized, comprehensive, and role-based software system is currently in development at the FBI. The role-based atmosphere will allow the ability to isolate and protect all data elements for all users based on who they are and what they can contribute to the system and the identification process. VICTIMS is designed to be a comprehensive and internet-accessible environment for the collection, storage, indexing, searching, and retrieval of all forms of data that might assist in the identification of unidentified human remains. The collected data types include (but are not limited to) photographs, facial reconstructions, anthropological reports, medical examiners reports, radiographs, text, case data, and NCIC data that are pertinent to assisting in identification. Many of these data forms have never been available in a searchable electronic format or viewable by the public.

VICTIMS, Unidentified Human Remains, National Data

D13 What Does a Forensic Entomologist Really Do?

Ralph E. Williams, PhD, Purdue University, Department of Entomology, 901 West State Street, West Lafayette, IN 47907*

After attending this presentation, attendees will be shown how forensic entomology is often used in forensic investigations, especially in death investigations. There have been some misunderstandings as to what a qualified forensic entomologist can actually provide. This presentation will spell out how forensic entomology contributes in the forensic investigation as to estimating the PMI and other aspects.

This presentation will impact the forensic community by providing the forensic community a clear understanding of the role and value that forensic entomology can provide in forensic investigations. A qualified forensic entomologist can play an important part of the investigation in helping to determine the PMI, habitat location, linking a suspect to the crime scene, and other aspects.

In defining what constitutes being a forensic entomologist it should first be understood the definition of the term forensic. The Webster Dictionary definition states "belonging to, used in, or suitable to courts of judicature or to public discussion and debate." In the broad sense then, a forensic entomologist deals with legal aspects in which insects may play a role. Death investigation, food contamination, wound invasion, civil suits/litigation involving insect nuisance complaints/infestation, among others, are situations in which a forensic entomologist may get involved.

In death investigations, the forensic entomologist can provide expertise in assessing the postmortem interval, possible site(s) of trauma, geographic location of death, toxicology of the decedent, and identity of the victim via DNA. These can be accomplished by a trained forensic entomologist because there is published information available as to the known succession of insect fauna on cadavers, known life histories of the most common forensically important species, and known geographical and climatic zones and conditions for various species.

With insects involved in food contamination, wound invasion, and civil/litigation cases, a forensic entomologist dealing in these areas has access to similar published information as to the insects that may be involved.

Discussion will focus on these areas that forensic entomologists may deal with and why they are asked by crime scene investigators, coroners, medical examiners, and attorneys to be involved and/or provide expert opinion on various cases.

Forensic Entomology, Forensic Entomologist, Postmortem Interval

D14 Historical Human Remains Identification: Skeletal Analysis, Facial Reconstruction, and DNA Analysis of Alleged James-Younger Gang Member

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After attending this presentation, the attendees will understand: (1) the use of skeletal analysis, forensic reconstruction and DNA testing for establishing personal identification in an historical case, and (2) the use of comparing published articles and newspaper accounts as documentation in the absence of antemortem medical records for establishing personal identification.

This presentation will impact the forensic community by demonstrating how case review, investigation of information, and evaluation of different identification methods can be used to establish personal identification of historical human skeletal remains.

An expanded investigation of a historic case was conducted in an attempt to identify human skeletal remains. The alleged skeletal remains of Charley Pitts, a James-Younger Gang member who participated in the 1876 bank raid in Northfield, Minnesota were donated to the Northfield Historical Society in 1981. In 1982, the remains were examined by a medical examiner from Hennepin County, Minnesota to determine if the skeletal remains could have been Pitts. In 2007, the Historical Society submitted the remains to Minnesota State University, Mankato for further investigative and forensic analysis in search of additional information about their identity.

An examination of historical records, articles, documents, and interviews was included in the investigation. A forensic analysis was also conducted which included an anthropological examination, a forensic facial reconstruction from a computer tomography (CT) scan of the skull, and DNA analysis by three labs; the Netherlands Forensic Institute Laboratory and two private laboratories in the United States.

Pitts' fatal injury was described as a gunshot wound between his 2nd and 3rd ribs approximately one inch to the left of the sternum. He suffered a buck shot injury in the right arm approximately five inches from the shoulder and another in the back, approximately five inches from the hip. He was described as 5'9 3/4" in height with straight black hair, a stubby mustache and short black beard. His body was transported to St. Paul, Minnesota and Dr. Frank Murphy, Surgeon General, embalmed the body. After its sojourn in the State Capitol for two days of public viewing, no verifiable evidence of the disposition of Pitts' remains has been located. Purportedly, medical students had the remains made into a medical study specimen. By the mid-1950s, the Stagecoach Museum in Shakopee, Minnesota displayed a skeleton alleged to be Pitts and in 1981 donated the skeleton to the Northfield Historical Society. However, some question the authenticity of the alleged Pitts skeleton since the Stagecoach Museum owner demonstrated creative showmanship skills in operating the reproduction western style town.

The general condition of the purported Pitts skeleton is the same as it was when the Northfield Historical Society received it as a donation. It is professionally assembled with wire and pins and some bones are connected with brass fittings. Approximately 95% of the skeleton is complete.

In the anthropological examination, gender determination was based on sexually dimorphic characteristics, overall size, and robusticity of elements. Based on the assessment of skeletal features, the skeleton exhibited male characteristics. The age, approximately 35-40, was estimated using the pubic symphysis, ectocranial suture closure, sternal rib end morphology, and auricular surface. Even though some of these methods are more accurate for estimating age, each was examined to arrive at an estimated age.

Ancestry was determined by examination of the skull and facial features. The skeleton's characteristics suggest primarily Caucasian ancestry with some Asian admixture. Stature was determined using the Trotter-Gleser technique. Measurement with the lowest error rate, that of the femur and tibia combined, was used to calculate the individual's height, which would have been approximately 5' 7". The skeleton was also examined for physical evidence of trauma and pathological conditions affecting the bones.

To produce a facial restoration, computer tomography (CT) files of the skull were converted to stereolithographic (STL) files. From the STL files, a copy of the skull was cast. Erasers indicating skin depths were attached on strategic anatomical landmarks and photographed on the Frankfort Horizontal Plane. Sketches were drawn and the skull was covered in modeling clay and sculpted for the finished forensic facial reconstruction.

For the DNA analysis, bone samples and three teeth were removed from the skeleton. A cross-sectional sample from the mid shaft left

femur, weighing approximately 30g and one molar were submitted to the Netherlands Forensic Institute for DNA analysis. Also, two longitudinal sections of femur weighing approximately 30g each and a single molar were sent to each of the private laboratories.

Descriptive data for Pitts was obtained from published articles, newspaper accounts, family interviews and postmortem photographs. In addition, the forensic facial reconstruction from the CT scan of the skull was compared to known photographs of Pitts to determine resemblance. In the identification process, the DNA extracted from the bone and teeth was compared to DNA from Pitts' great grandnephew. The analysis of the skeletal remains, facial reconstruction, and DNA were evaluated to establish whether the skeleton belongs to Charley Pitts or whether it should be eliminated.

Skeletal Analysis, Facial Reconstruction, DNA Analysis

D15 Estimation of Postmortem Interval by Morphological and DNA Changes of Blood

Amal A. Mashali, MD, Alexandria University, Faculty of Medicine, 20 Syria Street, Rousdy, Alexandria, EGYPT; and Maha A. Ghanem, MD, 51 Victor Amaneul, Semoha, Alexandria, 21615, EGYPT*

After attending this presentation, attendees will see the effect of time on the cellular morphological changes and DNA degradation which occurs in blood after death at variable time intervals.

This presentation will impact the forensic community by demonstrating how the estimation of the time of death is one of the most important problems in forensic medicine and law. Most experienced forensic pathologists agree that the ordinary postmortem changes are easily influenced by external factors. A variety of procedures are used for the purpose of postmortem interval estimation including the analysis of postmortem blood for various biochemical substances.

In the present study, postmortem blood samples were examined to demonstrate the effect of time on the cellular morphological changes and DNA degradation which occur in blood after death at variable time intervals. The study included 30 blood samples from autopsy and dead hospital cases, where light microscopic examination was used to study the morphological cellular changes of blood. Postmortem DNA changes were also studied using gel electrophoresis as well as flowcytometric analysis.

At six hours postmortem the neutrophils, oesinophils, and monocytes shared in showing pyknosis of the nucleus as a starting sign of white blood cell degenerative changes. At 18 hours postmortem, only the neutrophils and oesinophils started showing nuclear fragmentation, whereas, the monocytes didn't show this change until 24 hours after death. Disintegration of the neutrophils, oesinophils, and monocytes began to appear at 48 hours postmortem.

Gel electrophoresis was used in the present work to assay the integrity of DNA within the studied blood samples. Up to 18 hours after death, gel electrophoresis revealed that the majority of cellular DNA was intact. Starting from 24 hours postmortem until 72 hours, DNA fragmentation progressed where it began to smear in tracks indicating the presence of degraded, low molecular weight DNA as well as high molecular weight DNA. Upon reaching day three most of the DNA had been degraded to low molecular weight fragments.

Histograms obtained by flowcytometry revealed that autopsy and dead hospital samples showed similar patterns of DNA degradation after death with no significant difference observed. The values of degraded DNA increased gradually over different postmortem intervals, whereas the values of normal and double DNA content decreased gradually. A significant positive correlation was observed between time since death and the pattern of DNA degradation based upon the flowcytometric analysis of the studied samples. The resulting equations for estimation of postmortem interval from DNA content of cells measured by

flowcytometry revealed an acceptable degree of accuracy in accomplishing this goal

Postmortem Interval, Blood Morphology, DNA

D16 Under the Radar — Into the Forensic Pathologist's Domain: Recognition of the Deceased Victim of Human Trafficking

Sharon R. Crowley, MN, 122 Emeline Avenue, Santa Cruz, CA 95060*

After attending this presentation, attendees will gain an increased understanding of the dynamics of human trafficking. Some of the key indicators and physical manifestations, which may delineate a victim of human trafficking will be discussed. Attendees will also learn about an innovative trafficking first-responder program, part of a long-standing anti-trafficking program in San Francisco, CA.

This presentation will impact the forensic community by increasing awareness of the scope of the problem of human trafficking, improving the understanding of the etiology and manifestations of trafficking cases with a fatal outcome, and encouraging and promoting collaborative relationships with other professionals involved in eradication of trafficking.

Modern-day slavery exists in virtually every country of the world, including the United States. Everyday, individuals are held in domestic servitude and exploited for commercial sex. Current estimates by the annual State Department's *Trafficking in Persons Report*, estimate that 800,000 people are trafficked across international borders each year. Eighty percent are female; half are children. According to Ambassador Mark Lagon (2008), these numbers do not include the millions who are trafficked within national borders for the purposes of labor and sexual exploitation. The demand for cheap labor and commercial sex has created an industry that is tied with the illegal arms trade as the world's second largest criminal enterprise. Trafficking is the fastest growing (Health and Human Services).

Because of the high incidence of forced prostitution, it is timely to take initial steps at recognition of the victim who dies, either directly, or indirectly, as a result of the consequences of human trafficking. Efforts are being made nationally to heighten awareness among health care providers, of both the scope of the problem and recognition of health indicators.

Because so many trafficking victims are enslaved and exploited sexually, it may be difficult to discern the bigger picture. Numerous myths abound about prostitution. In a statement by the Bureau of Affairs, U.S. State Department, where prostitution is legalized, there is a greater demand for human trafficking. The vast majority of women in prostitution neither chooses nor wants to be there. Most are desperate to leave. Females and males who engage in prostitution are often targets of opportunity for criminals. Whether they engage in street prostitution or work in massage parlors, which effectively function as brothels, victims of trafficking are highly vulnerable. Closed brothels may operate out of private residences; these further isolate the working victim. Isolation, cultural separation, language barriers, and often an inherent fear of the police, may cause victims to miss opportunities to escape their dire situations. If they die, their deaths may go unnoticed as trafficking-related. The very measures that keep these individuals enslaved protect the traffickers. In order to begin to study how to better recognize the fatal victim of human trafficking, it may be helpful to explore lessons learned from programs that effectively interact with living trafficking victims. While a great deal is below the radar, much has been learned.

In San Francisco, California, one stellar program stands out for its unparalleled approach to intervention and prevention efforts. In 1992, *Standing Against Global Exploitation (SAGE)* was founded by Norma

Hotaling. SAGE's mission is to bring an end to commercial sexual exploitation and restore the lives of women and girls who are survivors of, or at risk of sexual exploitation and violence. The average age of the trafficking victim that reports to SAGE is the mid-twenties to mid-thirties; however, some SAGE clients may come for services that have been trafficked at some time in the past. The youth component of SAGE is targeted for 12-17-year-old clients, with an average age of 15-years-old.

California is a major entry point for human trafficking. Forty-three percent of the incidences in California occur in the San Francisco Bay Area. The majority of international trafficking victims seen at SAGE come from Asia and South East Asia, especially rural areas in the Philippines, Korea, China, Japan, Thailand, and Vietnam. The second largest source is Latin America, especially Peru and Mexico. Domestic trafficking constitutes approximately half of the clientele. For domestic trafficking clients seen at SAGE, preliminary proportions for race are as follows: African-American (55%), White (29%), Hispanic (12%), Asian (2%), and Other (2%).

In November 2007, SAGE launched the *Rescue and Restore, Reclaim Your Rights* campaign, an intense anti-trafficking effort in San Francisco, supported by Health & Human Services, Office of Refugee Resettlement. In January 2008, SAGE initiated the first of its kind, *Trafficking First Responder Team*, in partnership with the United Way of the Bay Area. Through a series of public service announcements and outreach materials, potential trafficking victims may be linked directly, 24 hours a day, with trained first responders, via information and referral specialists that have been trained by SAGE staff.

Nationally, Health and Human Services, Administration for Children & Families (ACF) actively promotes its *Rescue and Restore Campaign*. Legislative efforts include the 2000 *Trafficking Victims Protection Act*, which is designed for both U.S. citizens and non-citizens alike.

Additional, brief, succinct assessment, and documentation may prove extremely valuable in discerning and tracking fatalities due to human trafficking. Based on field research in nine countries on prostitution, the State Department concluded that few activities are as brutal or damaging as prostitution: 60-75% were raped; 70-95% were assaulted physically. A startling 68% met the criteria set for post-traumatic stress disorder. This was in the same range as combat veterans and victims of state-organized torture (Farley, *Journal of Trauma*, 2003).

In addition to malnutrition, physical abuse, and sexual assault, other public health implications include diseases such as tuberculosis, syphilis, HIV/AIDS, pelvic inflammatory disease (PID), and other sexually transmitted diseases. In discussing a five-country prostitution study, Raymond et al (2002) concluded that the extent of physical injuries and illnesses of women in the sex industry was overlooked. Prostitutes suffer higher rates of hepatitis B, greater risk of cervical cancer, fertility complications, and psychological trauma. Physical manifestations of these health problems may appear at autopsy and serve to raise the index of suspicion.

While the deceased victim cannot present a thorough history of victimization, certain findings, such as lifestyle information, where known, may prove useful. This may be especially true when combined with "missing" data, such as lack of identification, passport, or visa. The presence of blunt force trauma, perhaps in areas of the body normally covered by clothing, and indicators of sexual assault on genital examination may warrant further investigation. In living trafficking victims, some additional red flags may be a suspicious interpreter, or "friend", and disparity in the living conditions between victims and traffickers. If a massage parlor or business address is investigated, hidden luggage or other evidence may show that the victim/employee lived there. Food, dishes, and toiletries may be present.

Further study is needed to determine if there are additional markers or variables to help differentiate this special, uniquely vulnerable population of victims. In order to eradicate this shameful practice,

successful collaboration between those who serve the living and the deceased can only serve to be of immeasurable value to both, but ultimately to the victims.

Human Trafficking, Fatal Sexual Violence, Prostitution

D17 Death and Disability Due to Delayed Airbag Deployment

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After attending this presentation, attendees will learn of mechanisms of injury from late airbag deployment, which was the proximate cause of disability and death in this accident. The value of a multidisciplinary approach is emphasized in elucidating the split-second concatenation of several design, structural, and operational failures required to produce this copiously illustrated calamity.

This presentation will impact the forensic community by demonstrating the value of assembly of multidisciplinary groups of forensic scientists in the analysis of complex events.

To avoid a vehicle entering the highway from a side road, a 1997 Infiniti Q45 four-door Sedan swerved into the oncoming lane. This caused an offset head-on collision with a 1996 2-door Chrysler Sebring. All occupants in both vehicles were belted and the frontal airbags deployed. Of the six occupants of the Infiniti, only the driver was injured with a broken leg and big toe. The driver of the Sebring was dead at the scene and his daughter, age 9, in the front passenger seat sustained a depressed skull fracture and brain damage.

Why this enormous disparity in severity of injury to the two sedans? The working hypothesis was delayed airbag deployment in the Sebring.

An array of experts — automotive engineers, a blood splatter specialist, a forensic pathologist, a forensic radiologist, and other medical specialists — were assembled to analyze and reconstruct the accident and its sequelae.

The driver's compartment, markedly reduced by intrusion of the engine compartment and left front wheel well, entrapped him between the seat back, the airbag, and the steering wheel. The driver was not autopsied after the accident, but on exhumation, had compression injuries of the chest with multiple postero-lateral left rib fractures, lacerations of the lung and diaphragm, and hemothoraces. These injuries were attributed to the explosive force of the late deploying airbag crushing him against the unyielding seat back. The intrusions also caused multiple fractures of the lower extremities.

The child was unconscious in the front seat, which was in maximal forward position. After airlift to a trauma center, she was found to have seatbelt abrasions of her right neck and shoulder and her left hip, abrasions and contusions of her legs, and a left-sided laceration of the scalp. A CT revealed a depressed left parietal skull fracture and contusions and edema of the brain.

Unraveling the mechanism of the head injury required understanding a complicated series of failures of safety features in the Sebring. A paralegal noticed that the scar on the girl's head matched the configuration of the airbag door's corner. The pathologist superimposed an exemplar door in the scan to confirm the pattern.

The radiologist obtained a 3-D reconstruction of the calvaria from the original CT data. This showed a long, narrow depressed fracture suggesting impact on or from a dull rounded edge such as the airbag door which, on review of photos, had a bent corner facing the passenger's right. A luminol test showed blood on that corner of the door.

But how was the head juxtaposed to the door? The engineers remembered that failures of the latching system on the front seat rails of the Sebring had prompted a recall. This failure was confirmed in the involved vehicle. At impact the vehicle was twisted to the left, but the momentum of the child was directly forward, rotated her upper body clockwise and downward. A Canadian Transport test film had shown a delayed opening of both airbag doors of the Sebring. Thus, at an unfortunate millisecond in time, her accelerated left parietal area collided with the explosive force of the opening airbag door.

Follow-up medical evaluations predict permanent lower extremity disabilities and limited mental capacity at the 8-year-old level. A civil suit was filed for wrongful death, personal injury, and product liability.

This case emphasizes the value of assembly of multidisciplinary groups of forensic scientists in the analysis of complex events.

Accident Investigation, Airbag, Safety System Failure

D18 A Cross-Sectional Study Road Traffic Fatalities and Vehicular Homicide Investigation Practices in Denmark for 2000-2004

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After attending this presentation, attendees will be acquainted with road traffic fatalities and vehicular homicide investigation practices in Denmark.

This presentation will impact the forensic science community by examining vehicular homicide investigation practices in Denmark, as the results indicate a number of limitations to these practices.

Unlike the relatively universally uniform criteria for criminal prosecutions associated with deaths resulting from violent assaults, the criteria for when to prosecute for vehicular homicide in a traffic crash fatality is quite variable between countries. Some of this variability is likely due to the fact that there are no widely accepted standards for what constitutes a comprehensive investigation of a potential vehicular homicide case. Police and medicolegal investigation practices of such cases in the Aarhus, Denmark Police District over a five year period were evaluated in order to assess the consistency of various practices used to investigate traffic fatalities.

Police investigation reports were obtained for all road traffic fatalities for the years 2000 to 2004 (inclusive) in Aarhus Police District, Denmark, an area with a population of approximately 333,000 people. A total of 81 crashes were found, with 209 individuals involved comprising 92 deaths, 61 injuries, and 56 uninjured people. Data concerning the circumstances of each crash were gathered along with information relating to the judicial course of each case, including prosecution, conviction, and sentence. Additional information from the autopsy report was correlated with the police investigation findings when an autopsy had been performed. The data were pooled and described.

Postmortem examination was performed in 17 of the 92 decedents (18%). Analysis for blood alcohol was performed in 55 (60%) of decedents, of whom 20 of the 55 (36%) were positive, and 17 of 20 positives (85%) had a BAC > 50 mg/dl. Toxicological investigation for prescription narcotics and the most common illicit drugs (i.e., cannabis and amphetamine) was performed in five (5%) of decedents, of which two (40%) were positive. There were a total of 80 surviving drivers, 42 of whom (53%) were tested for alcohol and one was tested for drugs/medicine. Amongst the surviving drivers the police investigation resulted in 33 (41%) cases of potential culpability. Of these 33 investigated drivers, 22 (67%) were tested for alcohol, with only one positive result (5%) and one was tested for drugs, with a negative result.

A total of 28 of the 33 potential offenders were charged with one or more violation, whereas five of the investigated potential offenders were not charged at all. Twenty-six of the 33 were charged with manslaughter under Danish law (§241). Of the remaining 47 drivers who the police investigation did not reveal potential culpability, 20 (43%) were tested for alcohol, and one of the 20 (5%) was positive. Of the 92 decedents, 61 were drivers, and 41 of these (67%) were tested for alcohol, with 12 positive results (29%).

Postmortem examination was poorly correlated with fatalities in which there was a manslaughter charge; of the 26 cases where there had been such a charge, only three autopsies were performed, yielding a rate of comprehensive medicolegal death investigation in criminal traffic crash death cases of 12%. In contrast, in the 54 cases in which a driver survived but was not charged with manslaughter, there were a total of 12 postmortem examinations, yielding a rate of comprehensive medicolegal death investigation of the cases where the police did not reveal any culpability that was almost double that of the cases charged with manslaughter (22%). Although the number of fatalities in the present study was relatively small, the population represented by the Aarhus Police District was considered to be representative of Danish practices in general, as Aarhus is the second largest police district in Denmark, surpassed only by Copenhagen. The results of the present study raise a number of questions concerning criminal investigation of Danish traffic crash fatalities. In contrast with common practice in the U.S., in which the most common reason for a criminal charge in a traffic fatality is intoxication of the offending driver, a large proportion of Danish drivers (one in three) were charged with a serious crime when alcohol presence was present in only one of the investigated surviving drivers, and autopsy was performed in less than one in five decedents. It appears that there is a lack of a standardized protocol for the investigation of potential criminal traffic crash fatalities in Denmark.

Further study is needed to determine if the results from Aarhus are consistent throughout Denmark. If this is found to be the case, a reappraisal of Danish practices concerning investigation of traffic crash homicides is warranted.

Vehicular Homicide, Postmortem, Toxicology

D19 Trends in Suicide in Geneva, Switzerland: 1983 - 2007

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After attending this presentation, attendees will understand trends in suicide in Geneva during the last quarter of century.

This presentation will impact the forensic community by identifying the following: quantifying the lethality of suicide methods used in Geneva, Switzerland, over a period of twenty-five years, and examining method-specific case fatality by age, gender, religious confession, marital status, dates, suicide method, and co-morbidities (alcohol and other illicit drugs use and mental illness).

Methods: A review of all autopsies conducted at the forensic medicine facility from the year 1983 to the year 2007. All the cases of suicide in Geneva, a little city of 400,000 inhabitants, go through the Institut Universitaire de Medecine Legale.

Results: During this period, there were 2007 documented cases of suicide; this number represents an average of 80 cases per year at a rate of 16.72 per 100,000 inhabitants. Of these deaths, 62% occurred in males (n = 1,243) and 38% in females (n = 764), for a ratio of 1.6:1.

The methods used were in decreasing order: jumping (22.5%), hanging (20%), firearm (19%), poisoning (15.5%), drowning (13%), CO (2.5%), cutting (2%), and others (5.5%: mainly throwing themselves in front of a train).

The most common methods of suicide among men were gunshot (27%), hanging (24%), and jumping (18%). In females, the most common methods were jumping (30%), poisoning (24.5%), and drowning (18%).

The most common method of suicide among men was firearm in all age groups, whereas in females in the under 25 age group – jumping, poisoning among adult age, and jumping again in the 65 and over age group. Gunshot was the most common method among unmarried, divorced, and widowed men, while hanging was the most common among married men. Jumping from heights was the most common method among unmarried, divorced, and widowed women, while poisoning was the most common among married women.

A significant change was not seen with the changes of season. The rate of elderly people who committed suicide was considered high, but it was very low for young people.

Finally, co-morbidity like depression, illness, alcohol, and other illicit drugs use were analyzed.

Conclusion: Despite the rate of suicide in Geneva being quite high, this rate has remained stable during the last quarter of century and it is especially low for young people.

Suicide, Death, Geneva

D20 Custody-Related, Excited Delirium Deaths Following Intermediate Weapons Use in Ontario

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After attending this presentation, attendees will have an understanding of the Ontario experience with a review of three Excited Delirium (ED) in custody deaths that were investigated and subsequently examined in public inquests. In all cases intermediate weapons (either baton or conducted energy device (CED)) were deployed on the subject during apprehension by police. The inquests recommended legislative changes to allow CED access to all front line officers.

This presentation will impact the forensic community by examining the relationship between the intermediate weapons and the cause of death, highlighting how concerns regarding the often-controversial use of CEDs are likely not justified, while a non-controversial intermediate weapon may be lethal.

The Province of Ontario, population of 13.5 million, has a medical coroners' system. Under the Coroners Act, all deaths that occur while a subject is in police custody must be investigated and then examined at inquest, a public hearing that assures citizens that the circumstances of the death of no one of its members will be overlooked, concealed, or ignored. Three cases of individuals with Excited Delirium (ED) that evolved into custody deaths occurred in Ontario between August 2000 and July 2004. In all cases, there was a violent, prolonged struggle between the subject and officers before sufficient restraint and arrest could be affected.

The first case involved a male, age 55, with a long history of bipolar disorder and numerous hospital admissions for psychosis. Police were dispatched to a convenience store for an "unwanted guest" causing a disturbance. On their arrival, officers found the male to be agitated, but compliant. While obtaining routine information from him, he suddenly struck out at one officer. A violent struggle ensued as officers attempted to take control of him. In an attempt to curtail his flailing and kicking, he was forcefully struck multiple times by an extendible metal baton, but

seemed to be impervious to pain and exhibited extraordinary strength. Four officers eventually succeeded in restraining him in handcuffs in the prone position. Within seconds he went vital signs absent (VSA) and could not be resuscitated. The forensic pathologist found cause of death due to fat embolism complicating multiple blunt force soft tissue injuries. At inquest, the jury concluded the underlying cause to be Excited Delirium complicating Bipolar Disorder, and amongst its recommendations suggested that the prolonged struggle might have been avoided or shortened had officers been able to deploy a CED.

The second case involved a male, age 33, with a history of crack cocaine abuse and multiple prior episodes of ED. Police were summoned because of aggressive and violent behavior, and during prolonged attempts to apprehend him, used pepper spray with no apparent effect, and eventually three drive-stun mode CED deployments. The struggle lasted several more minutes before he was successfully restrained in wrist and ankle cuffs, then transported for medical assessment. At the hospital, he struggled again for several minutes before becoming VSA. Postmortem examination found no anatomic cause of death, with cocaine levels suggestive of binge use and consistent with those found to cause ED. The inquest jury found cause of death to be Cocaine-induced Excited Delirium, with prolonged struggle followed by restraint a significant contributing factor. They recommended that front line officers be authorized for CED use in the expectation that it might shorten the time to successful apprehension.

The third case involved another male, age 29, with a history of cocaine abuse and violent behavior. Police entered into a violent struggle with him when he tried to resist arrest. After several minutes, a tactical officer arrived and delivered a two-second long drive-stun mode CED deployment to his back. As with the previous case, the struggle to restrain the subject continued for several more minutes before he was successfully subdued in a hog-tied position. Shortly thereafter he went VSA. The pathologist attributed cause of death to Restraint Asphyxia, due to Cocaine-induced Excited Delirium. The inquest jury agreed with this conclusion, and again recommended that front line officers be authorized to use CEDs.

These three custody deaths are typical of cases of Excited Delirium, where subjects exhibit aggressive behavior, super-human strength, insensitivity to pain, and ineffectiveness of pepper spray during prolonged struggles with police officers. “Less lethal” use of force options, such as the extendable baton, may cause injuries that lead to death, while experiences to date in Ontario has shown no direct link between CED use and serious injury or death. Inquest juries have consistently recommended expansion of CED use to include front line officers, expecting that early deployment in cases of Excited Delirium will lead to faster control and apprehension and prevent deaths that result following prolonged struggles and prone restraint.

Excited Delirium, Intermediate Weapons, Custody

D21 Suicide by an Unusual Improvised Firearm

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After attending this presentation, attendees will increase awareness of the spectrum of unusual items that may be employed as an improvised firearm.

This presentation will impact the forensic community by expanding the knowledge of types of items that may be employed as improvised firearms. This knowledge is of importance to police, forensic scene investigators, forensic pathologists, and firearms examiners.

A 38-year-old male was found dead in his automobile in a parking area adjacent to a vehicle salvage business. A soot-covered defect was found in his shirt with an underlying gunshot wound that appeared as a contact entry wound. A wrench socket covered with tape and clamped

in vise-grip pliers was found on the floorboard of the car near his left foot. A fired semi-automatic handgun cartridge was secured in one end of the socket. A claw hammer was also found in the front floorboard of the vehicle.

At autopsy, the subject had an entry gunshot wound over the precordium of his chest. Its appearance was consistent with a contact entry wound through clothing and a corresponding defect was found in the shirt. The “muzzle” imprint surrounding the wound and soot deposit had a hexagonal configuration. The wound track passed through the heart, diaphragm, and stomach, and deviated downward at the posterior left eleventh rib. A large caliber jacketed projectile was recovered from soft tissues of the lower left back; there were no visible land markings on the slightly distorted projectile.

The improvised weapon, with fired cartridge case in place, and the recovered projectile were inspected. The cartridge had been secured in the base of the socket by metal wire inserted in the extractor groove and twisted on each side. This prevented the rimless cartridge from falling into the socket and held it in place firmly enough for more than one blow by the hammer to discharge the round. The projectile itself bore varying striations from interaction with the sides of the socket.

This case presentation is intended to inform medical examiners, death investigators, police investigators, and firearms examiners of the unusual features of unique and improvised firearms.

Improvised Firearm, Standard Tools, Suicide

D22 Corresponding With “The Happy Face Killer” – A Case Study

Lyndsie N. Schantz, BS, 700 Forbes Avenue, Apartment 1816, Pittsburgh, PA 15219*

After attending this presentation, attendees will be introduced to a unique opportunity where Duquesne University Forensic Science and Law students corresponded with a serial killer for over a year.

This presentation will impact the forensic community by examining the psyche of a murderer as well as discuss the errors made by law enforcement and how these miscalculations affected this specific case.

The goal of this presentation is to introduce the members of the forensic science community to a unique opportunity where Duquesne University Forensic Science and Law students corresponded with a serial killer for over a year. Criminal Investigations, a two semester upperclassman course led by Former Pittsburgh Police Commander Ronald Freeman sought to initiate correspondence with the “Happy Face” Serial Killer, Keith Hunter Jespersen, in order to gain the perspective from the polar side of law enforcement. Jespersen is the subject of several documentaries and the book, I: The Creation of a Serial Killer by Jack Olsen. This presentation will impact the forensic community by examining the psyche of a murderer as well as discuss the errors made by law enforcement and how these miscalculations affected this specific case.

Keith Hunter Jespersen is accused of murdering eight women by means of strangulation. He committed these murders in numerous jurisdictions across five states. While he has confessed to all of them, he has not yet been prosecuted for every homicide. Jespersen’s familiarity with destroying the identification of his victims allowed him to elude arrest for years. However, the real twist of events came about when two other people were convicted of his first murder. Wrongful convictions have become a topic of great interest in the past few years. Jespersen himself was not the victim of a wrongful incarceration rather two other individuals who claimed to have knowledge of the murder were convicted for the murder. They were imprisoned for years until Jespersen was approached by the police regarding the death of his girlfriend, his final victim. During this period, Jespersen attempted suicide twice and then was arrested for killing his girlfriend. During one

of the suicide attempts, he left a letter to his brother chronicling his murders. With his brother releasing this information to the police, Jespersion finally confessed to the killings and subsequently fought for the release of the two individuals who were wrongfully convicted.

The impetus for the project came about when the course instructor read *I: The Creation of a Serial Killer*, which is a narrative of Jespersion's life. Mr. Freeman presented his idea of corresponding with Jespersion to his Investigations class. Three students readily volunteered to initiate the correspondence with the killer. There was a steady flow of letters exchanged on the order of once a week. Immediately, students perceived Jespersion's need to control in his communication with the class. In addition to the letters, a one hour phone conversation allowed the class to hear the voice of a murderer.

Although it was the wrongful conviction that sparked the interest of the class, the correspondence with Jespersion taught the class so much more, including insight into the dark nature of humanity. The individuals in the class were exposed to the criminal mindset as well as the point of view of law enforcement due to the professor's extensive knowledge from over three decades of working in the homicide division. This was an incredibly unique opportunity afforded to a group of senior Forensic Science and Law majors. Not only was this project a great learning experience, but it can be used in the justice system to help convict Jespersion of a prior murder.

Serial Killer, Wrongful Conviction, Criminal Mindset

D23 Effective Use of the Multidisciplinary Approach Critical to Solving Contemporary Violent Crime

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After attending this presentation, attendees will understand the increasing sophistication and planning of violent crime by contemporary criminals, the impact on violent crimes due to the explosion of forensic science knowledge in mainstream media, the necessity of employing a multidisciplinary scientific approach when conducting violent crime investigation, and the enduring and critical role of "old-fashioned" detective work, when investigating contemporary violent crime.

This presentation will impact the forensic community by demonstrating that the complexity, motivations for, and planning of contemporary violent crimes necessitate adherence to time-honored crime scene processing and investigative techniques bolstered by effectively using the wide spectrum of scientific disciplines within the forensic community to effectively resolve contemporary violent crime.

The explosion of forensic crime dramas and true-life documentaries in the main stream media, and the parallel increase in available academic forensic education, has forever impacted the art of criminal investigation. Savvy criminals can easily learn through a wide variety of sources how to circumvent traditional crime fighting strategies, thwart traditional crime scene processing techniques, and mask or obliterate various types of physical evidence traditionally associated with interpersonal violent crimes. The authors have seen, over the course of their combined five decades of criminal investigative experience, a significant shift in the time and effort spent by perpetrators in altering, and sometimes thoroughly staging, violent crime scenes. These activities occur to avoid forensic detection, in even the most emotion, anger, and drug-fueled violent crimes.

Case studies will be presented which illustrate how knowledge of forensic science affected the planning and execution of violent crimes, and the efforts at crime scene manipulation by perpetrators in the aftermath. The case studies will demonstrate how leveraging the multidisciplinary approach in processing the crime scene, incorporating

the forensic pathology and laboratory findings, and combining the results with traditional stalwart investigative methods resulted in identification of the perpetrators. The case studies anecdotally support the belief of the authors that contemporary violent criminals demonstrate an increasing forensic sophistication in their crimes.

Crime Scene, Multidisciplinary, Investigation

D24 From 1997 to 2007: Modified Approach to Sexual Assault in Our Experience

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After attending this presentation, attendees will understand the medico-legal findings in a population of sexual assault cases assessed in Palermo in the years 1997-2007.

This presentation will impact the forensic community by demonstrating the role of adequate training of health professionals in this field of forensic application. An interdisciplinary approach has a strong impact with regard to sexual abuse and "gender" violence (i.e., against children and women), how victims survey their situation, and the new approach of the Italian legislation which offers the widest support to victims.

An essential aspect of sexual violence is represented by the condition of the victim. Another aspect of sexual violence is if the victim can make an informed decision with regard to what has happened to them and the different proposals offered to them.

Sexual abuse can be considered even in cases where the victim is never physically touched. An example of this would be where a victim has viewed an act(s) of a sexual nature or made to listen to conversations with a sexual content. These are classified as sexual abuse cases because the victim has seen or heard sexual content that is not age appropriate or because of their relationship with the abuser.

Furthermore, intra-family sexual abuse produces, in principle, the most serious effects, even when it is compared to abuse that has occurred outside of the family.

According to Italian law (act 609 bis of law 66/1996), anyone who uses violence, threats, or abuse of authority to force individuals to perform or undergo sexual acts is punished with imprisonment anywhere from five to ten years.

If the sexual act is committed on a person who is mentality or physically impaired or challenged, or if the perpetrator blames another for their acts, they too will receive imprisonment anywhere from five to ten years.

Act 609 also includes language that states there is the penalty of imprisonment anywhere from six to twelve years, if the sexual act is committed to: (1) Any one under the age of fourteen, (2) Use of weapons, alcohol, narcotics, drugs or other substances that can seriously damage the health of the victim, (3) Impersonation of a public official or someone with official authority, (4) Limits to the personal freedom of the victim, and/or (5) If the victim is under the age of sixteen and the perpetrator is a parent, adoptive parent or a guardian. If the victim is

under the age of ten, the penalty of imprisonment is increased to seven to fourteen years.

Sexual abuse can produce many kinds of psychological problems, which are subjective in nature. Some of these subjective responses are influenced by age of the victim, duration of the abuse, the presence or absence of penetration, the use of violence, personal characteristics of the victim, concurring psychological problems, if the victim can share their experience of abuse with someone, emotional support, and other life experiences. These life experiences may worsen or help the victim gradually overcome the abuse.

In 2005, a team was assembled that includes forensic physicians, gynecologists, surgeons, and psychiatrists who can examine an assault victim. The legal authorities or the victim can request an examination. The examination consists of a medical history and the clinical examination follows adopted standardized procedures. The victim is also given information with regard to their personal protection. The team also collaborates with non-profit agencies that focus on human rights and are authorized by a European Council.

During this period about 100 victims of sexual assault were examined, recording demographic information (age, gender, time elapsed before consultation), circumstances about sexual assault (date, place, assailant's identity when known, frequency of the assault), type of assault (penetration, non-penetration).

The circumstances of the assault were based on the victims' and any witnesses' statements.

The medico-legal outcomes revealed that of 100 victims examined, 12 were males and 88 females; 35 of these victims were children less than ten years of age; 31 victims were between the ages of 10 and 14 years old; and 34 were older than 14 years of age.

The assailants were, for the most part, fathers. In less than one-third of the cases were there signs of sexual violence (bruising, excoriations, abrasions).

In this presentation, research data obtained which relates to the social, cultural, and legal outcomes of medico-legal evaluation in court systems will be analyzed.

Sexual Abuse, Medico Legal Examination, Legal Outcome

D25 Imposters: Physical Findings That Can Be Mistaken for Sexual Assault Injuries

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After attending this presentation, attendees will learn how to distinguish between normal conditions, diseases, and injury in the sexual assault victim and apply new knowledge to case studies.

This presentation will impact the forensic community by reviewing existing information and highlighting the importance of distinguishing between normal findings and conditions that are made worse because of injury. Health care providers will use this information for differential diagnosis.

The interpretation of the injury following sexual assault has been challenged in recent literature. Noted physical findings, in particular bruising patterns, may be confused with intentional injury, when they are in fact unintentional. Literature has revealed that injury may occur in consensual relationships and a body of literature exists that describes conditions that will be made worse with penetration that is not forced. The cyclic nature of genital tissue response to estrogen has been established and mid-range theories have been promulgated that explain some injury in the pre-menarchal and post-menopausal females. In addition, complex changes to genital tissue occur with conditions or infections that may or may not be sexually transmitted. Case studies will be presented that are complex and require decision making by the health

care provider charged with evaluating the victim of sexual assault. Tools that assign classifications will be introduced to compare and contrast their usefulness in determining whether or not the injury is from sexual assault.

Non-Specific Injury, Blunt Trauma, Specific Injury

D26 Forensic Nurses on Crime Scene: The Southern Italian Experience

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The goal of this presentation is to provide an overview of the development of forensic nursing in Southern Italy and to illustrate the unique contributions of the professional nurse in death investigation.

This presentation will impact the forensic community by demonstrating how nurses are utilized within the Office of the Medical Examiner of the University of Bari. The use of forensic nurses has positively impacted the forensic science community and demonstrates the unique contributions of the professional nurse in solving cases.

The University of Bari has chosen to give major emphasis to forensic nursing in the advanced educational degree (i.e., Magisterial Bachelor Degree). The educational program addresses forensic topics such as elder and child abuse, domestic violence, mass disasters, evidence collection and preservation, and death investigation. A Master's program on postmortem findings and crime scene investigation provides additional information and advanced clinical training in the field. Four typical examples of forensic nursing activities in Bari will be presented.

Case #1 - Multiple Self-Inflicted Incised and Stab Wounds: In September 2007, a 48-year-old man was found dead in his summer residence by his wife and daughter. Police investigators, a medical examiner, and a forensic nurse investigated the crime scene. The man's body was on the floor of bedroom; his shirt was unbuttoned and soiled with blood. There was also blood on the bedroom floor and on the bed. A kitchen knife was found near the body and there was a suicide note on the bedside. The cause of death was 36 incised and stab wounds. In this case, a forensic nurse recorded body and environmental temperatures, collected evidence while preserving the chain of custody, and took on-scene photographs. Upon order of a prosecutor, a few days later, the nurse interviewed relatives and friends of the victim to reconstruct the last moments before death in order to understand the manner of death.

Case #2 - Starvation Due to Religious Delirium: In July 2007, the bodies of two elderly sisters were found mummified on chairs within their country home. A third sister was found alive, but with mental confusion. Mummified carcasses of cats and dogs were found close to the bodies. There were small containers with white powder that was later identified to be sodium carbonate (Na₂CO₃). Procedures to solve the case involved the contributions of different forensic specialists including a pathologist, nurse, entomologist, criminologist, toxicologist, and a veterinarian to define the time since death, the cause and manner of death, and to obtain a psychiatric profile of the surviving sister. The role of forensic nurse was important in noting and collecting any evidence at the crime scene: mapping the positions of the bodies,

documenting entomological findings, searching for unknown substances closest to the bodies, etc. The nurse discovered a secret diary of the surviving sister where she noted daily events during last three years. In this diary there were many attached receipts, checks, and bills. All of this evidence was useful in understanding what happened in the house and the reasons that the remaining live sister continued to reside among the mummified bodies.

Case #3 – Work-Related Death: In February 2008, four workers died suddenly from inhaling hydrogen sulfide (H₂S) while washing a road-tanker at their workplace. One died 24 hours later in a public hospital. The forensic nurse interviewed the other workers on the scene, documented evidence about substances that the tanker was transporting, and went to the hospital to review clinical documentation of the survivors a day later.

Case #4 – Anthropological Excavation: In August 2007, human remains were discovered by a forester during a search of the country surrounding Miglionico (Southern Italy). There were 286 bone fragments excavated that had been buried. The forensic nurse with a special background on skeletal remains, assisted with verification of personal identity during all phases of the excavation procedures and examination of each fragment. His contributions were particularly effective in the collection and packing of all the evidence that had to be sent to the laboratory.

Conclusion: Forensic Nursing is a new career opportunity in the Office of Medical Examiner of Bari (Southern Italy). The Office oversees the majority of forensic cases associated with 48 towns located in the Region (Apulia) with a total population of about 1.5 million. Special investigations are submitted from other southern regions (Calabria, Basilicata, Campania) when a specialized forensic team is required in solving a case. The forensic nurse is an effective member of the forensic team.

Forensic Nursing, Crime Scene, Death Investigation

D27 The Council of Forensic Medicine: A Tragedy or Good Luck for Turkey?

Nevzat Alkan, MD, Istanbul Tıp Fakültesi, Adli Tıp Anabilim Dalı, Capa, Istanbul, 34390, TURKEY*

After attending this presentation, attendees will understand the structure of the council of forensic medicine in Turkey and will have discussed if can it be a model for other countries.

This presentation will impact the forensic community by presenting knowledge about Turkey's forensic medical system.

Expertise in forensic sciences is an important tool for law processing in all countries. Forensic examination is needed for an objective solution in majority of cases.

Ataturk and his associates founded the Turkish Republic in 1923. This new Republic encouraged different ways of thinking and higher education, which all lead to developments that have become standards in the modern world. One area that benefited from these developments was the modernization of the legal arena. The Council of Forensic Medicine, charged under the Ministry of Justice in 1923, was but one of the institutions formed in the young Republic.

The Council of Forensic Medicine is an expert organization located in 50 out of the 81 cities in Turkey. The Council's headquarter is in Istanbul. The Council's framework includes an assortment of medical disciplines.

Located in the Council's headquarter, are six specialized committees and six specialized departments. The duty of the 1st

Specialized Committee is death investigation, while that of the 2nd is to report on intentional laceration; 3rd on occupational diseases, malpractice cases, and deferment of detention due to old age or illness; 4th on forensic psychiatry; 5th on cases of poisoning and allergy; and 6th on domestic violence, sexual assault, and child abuse. Among the six Specialized Departments, the Morgue has the duty to perform autopsies, while the Chemistry Department makes toxicologic and narcotic analysis in body fluids. The Biology Department performs paternity testing and DNA applications; the Physics Department's duty is to perform document examination, trace analysis and ballistic examination; the Traffic Department investigates the forensic cases that have resulted from traffic accidents. The Psychiatry Department has an Observation Unit, and after a three week evaluation, passes its final opinion on the patients to the 4th Specialized Committee.

Under the Ministry of the Interior, there are four gendarme and ten police criminal laboratories located in various city centers throughout Turkey. Included in these laboratories are various forensic departments. At this time, there are no advanced private forensic laboratories.

Forty-one out of the forty-five medical facilities that are housed in the seventy-five universities in Turkey have forensic medical departments. These facilities have inadequate infrastructure and personnel. This limits routine applications. Courts often require expertise, which comes from various non-forensic institutions. These institutions are not well organized and lack modern technology. Therefore, the most of the workload is given to the Council of Forensic Medicine in all parts of Turkey.

In this presentation, information on the structure of the forensic sciences and forensic medicine in Turkey, as well as the expertise areas, is given. The different aspects of the topic "The Council of Forensic Medicine: A tragedy or good luck for Turkey? Can it be a model for other countries?" is discussed.

The Council of Forensic Medicine, Turkey, Forensic Medicine

D28 Science for Justice and Health: The UNODC's New Forensic Work Program

Justice N. Tettey, PhD, United Nations Office on Drugs and Crime, Vienna International Centre, Vienna, A-1400, AUSTRIA*

After attending this presentation, attendees will learn about the new forensic work program of the United Nation's Office on Drugs and Crime (UNODC) whose goal is to increase the quality of forensic science services worldwide from the crime scene to the forensic laboratory.

This presentation will impact the forensic community by demonstrating the importance of forensic science organizations in the delivery strategy of the UNODC's forensic services worldwide.

In 2007, the Laboratory and Scientific Section of UNODC embarked on a forensic work program which aimed at increasing the worldwide availability of quality forensic services from *the crime scene to the forensic laboratory*. This presentation looks at the relevance of the program to the organization's strategy on drugs and crime. Also, the mechanisms of support in forensics such as the international collaborative exercise and worldwide collaborations and partnerships are discussed and the presentation concludes by looking at the current priorities of the work program and examining the role of forensic science organizations in achieving the UNODC's objective of Security and Justice for all.

United-Nations, Forensic, Crime

D29 The Preparation of a United Nations Manual on Crime Scene Investigation for First Responders and Policy Makers in Developing Nations

Peter R. De Forest, DCrim, John Jay College/CUNY, 445 W 59th Street, New York, NY 10019; and Justice N. Tetey, PhD, United Nations Office on Drugs and Crime, Laboratory and Scientific Section, Vienna International Centre, Vienna, A-1400, AUSTRIA*

After attending this presentation, attendees will gain an awareness of the role of the United Nations in assisting developing nations in establishing forensic science systems.

This presentation will impact the forensic community by showing how the manual will guide governments in developing nations in setting up scientifically based systems for the investigation of crime and event scene.

This presentation will describe a concise manual on crime or event scene investigation being developed by the United Nations Office on Drugs and Crime (UNODC). The target audience for the manual is first responders and policy makers. The working title of the manual is: *Crime Scene and Physical Evidence Awareness for Non-Forensic Personnel*. The manual was designed to assist governments in developing nations to establish and improve the capabilities of first responders and promote a scientifically based crime scene investigation. The preparation and publication of the manual is part of a larger initiative of the UNODC in assisting developing nations with the establishment of forensic science systems to foster its dual goals of security and justice in the developing world.

United Nations, Crime Scene Investigation, Developing Nations

D30 Death Caused by Trash Collector Crushing: A Case Report

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After attending this presentation, attendees will learn about a case, which had limited exposure in the form of literature. In the presented case, the victim had initial blunt trauma to the chest, which evolved into open trauma, and resulted in a death due to a trash collector's actions.

This presentation will impact the forensic community by explaining, that unlike "traditional" blunt force trauma, a body that has had an extreme amount of force placed on it from an "externalized" source makes for a novel mode of death and detection of the body.

The victim was a 71-year-old Caucasian male whose corpse was found in a public landfill. When the corpse was discovered it was in an advanced state of putrefaction. The victim had the habit of looking through trash dumpsters and it appears that the victim lost his balance and fell inside the dumpster. Once the victim was inside the dumpster, the lid closed. The victim could not open the dumpster's locked lid, as it could only be opened from the outside by way of a foot pedal, due to a unique spring mechanism.

The victim remained in the dumpster for at least a few hours, possibly having been stunned by the smell of the garbage, and was crushed/compressed by the trash vehicle that collected the trash. The now compressed victim, inside the dumpster, was taken to the public municipal landfill the next day where the dumpster was emptied.

The victim, who sustained a high degree of compression, was crushed. There was closed trauma to the chest and due to the compaction forces lead to complex injuries. The injuries that were sustained by the victim were evisceration of the thoracic and abdominal organs, crushing to the chest, spine and bones, migration of the thoracic organs from its diaphragmatic breach, explosive injuries to multiple organs, and decay of parenchymatous organs which resulted in the virtual instantaneous death of the victim.

The autopsy report of this victim will be presented. Photographic material will show the presence of large hemorrhagic infiltrations, fractures and galeal bleeding of the victim's head and will confirm that the victim was alive when he fell into the dumpster, and that his death could not have been a result of anything else, except being crushed/compressed to death in the dumpster.

Trash Collector, Blunt Trauma Chest, Crushing

D31 A Review of Asphyxia Cases in the Lincoln, Nebraska Area From April 2003 to July 2006

Casey C. Anderson, BA, University of South Florida, 4202 East Fowler Avenue, SOC 21E, Tampa, FL 33612*

After attending this presentation, attendees will be provided an overview of: the epidemiology of asphyxia deaths in the Lincoln, Nebraska area, the importance of compiling a regional database among this type of death to aid death investigations, and the characteristic injury patterns from different types of asphyxia deaths.

This presentation will impact the forensic science community by using this regional compilation method to compare and help predict the epidemiology and demography of underlying factors affecting asphyxia deaths, increasing awareness of the different types of asphyxia cases, uncover risk factors in reference to SIDS (Sudden Infant Death Syndrome) deaths, as well as observing the epidemiological and demographic differences of asphyxia deaths between regions. This study can be utilized on a large scale for discovering regional differences to better understand different asphyxia deaths. The injury patterns will also allow death investigators to compare injuries found on a body of an asphyxiated decedent to injuries established from different causes of death. This will give investigators a cross-reference database to confirm findings in difficult or suspicious cases and possibly lead to conclusions that are more accurate.

Data was collected from autopsy reports and investigation supplements provided by the city of Lincoln's forensic pathologist, ranging from the dates April 2003 to July 2006. The 68 identified cases were then compiled and statistical tests were performed using a computer program in order to uncover the frequencies of different variables. The variables tested were: age, sex, ancestry, cause of death, manner of death, location, drug use, and injuries sustained related to the death. The seven types of asphyxia cases analyzed are: Sudden Infant Death Syndrome (SIDS), drowning, hanging, carbon monoxide poisoning, suffocation, and positional asphyxia. The collection of data from the forensic pathologists' records give an accurate depiction of what death investigators will find at the time a body is discovered.

The results illustrate most asphyxia deaths in the Lincoln area were predominately comprised of Caucasian males with a mean age of death at 27.7, and large drug usage. Natural death, more specifically SIDS, case results showed the majority of the decedents' deaths occurred in a crib, and half of the total number were ill. Cyanosis was also found to be present in a significant portion of the cases when the decedent was discovered. Two types of accidental deaths, suffocation and drowning, were established. Accidental suffocation cases showed a significant portion of deaths occurred in a bed with a large percentage of the victims

being children. Accidental drowning victims were equally found in locations either in or around the immediate home, or a lake, and a significant amount of the victims had some form of cranial hemorrhage. Lastly, suicides were the most dominant manner of asphyxia, consisting of 35.29% of the total cases. The majority of suicidal hangings used an electrical cord, and an equal distribution of the cases used either an article of clothing or a rope as the next most common ligature choice. Neck abrasions from the ligatures were most commonly found, followed by contusions, then lacerations from the ligature. Cyanosis was found in a small percentage of the cases. Location data showed that the home was the most common place for a suicidal hanging to occur, followed by an outdoor location. An interesting injury pattern associated with suicidal hangings showed that those who used a nylon rope were the ones with a presence of petechiae, specifically in the larynx, trachea, and lungs. Lastly, suicidal carbon monoxide poisoning all occurred within the victim's car. Positional asphyxia cases were found to have inconclusive data because of the lack of a significant sample size.

According to the 2007 U.S. Census estimate, the demographics of the Lincoln, Nebraska area population leans towards a more dominant Caucasian population (89.25%), with 99.2 males to every 100 females, and the average age of residents being 31 (U.S. Census Bureau). These variables are examples of why regional databases need to be made, for they could change according to the demographic profile of the region. Death investigators could greatly profit from such a model, for similar cases could be cross-referenced and used to efficiently close a case.

Asphyxia, Epidemiology, Regional Model

D32 Describing the Setup and the Functionality of a Medicojudiciary Unit for Sexually Assaulted Children in France

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After attending this presentation, attendees will be briefed on the characteristics of a medico-judiciary unit for sexually assaulted children. The unit gathers various competences in a same place and at the same time in order to optimize judiciary operations while protecting children's health.

This presentation will impact the forensic community by promoting and developing the concept of multidisciplinary units for sexually abused children.

The increase in sexual abuse allegations to children and the diversity of support agents involved has led to a general review of healthcare management.

It is clearly important to be able to coordinate the necessary judiciary interventions with the medical, social, and psychological support for the child. In order to protect the child and the prevention from any further trauma, the child should be cared for in a single place, where all the support agents could meet him or her. Such a unit has been created at the University Hospital of Angers. This multidisciplinary unit is called the Permanent Pediatric Centre for Children in Danger (Permanence d'Accueil Pédiatrique de l'Enfant en Danger).

This center was created in 2005. In this facility, 845 children have been seen (female: 66% and male: 34%). The average age, at which the medical examination took place, was 15 years of age, with the youngest victim at nine months of age and the eldest at 18 years of age. Sexual abuse was presumed to be suffered in 89% and for 11% of the cases physical violence was also suspected. The police are also involved in this structure. A nurse is present to receive the child/children and its

family. Investigators can use a special room to interview the children and then document the conversation. After the interviews, forensic examinations are performed by a forensic medical examiner in the same department and in a special room (with colposcope). The same nurse is present during the examination. Pediatricians can be called to give some medical advice or provide medical care.

The family and the children also meet with the social worker and, sometimes, a psychiatrist. This unit seems to be an appropriate answer, facilitating various competences while respecting particularities and the field limits of each support agent.

Characteristics and the particular requirements of the care of sexually assaulted children in this medico-judiciary unit will be explained.

Sexual abuse, Child, Genital Examination

D33 Infrared Analysis of Human Remains

Diane K. Williams, PhD, Federal Bureau of Investigation, 2501 Investigation Parkway, Quantico, VA 22135*

After attending this presentation, the attendee will gain a better understanding of how infrared spectrometers may be used to detect human remains.

The presentation will impact the forensic community by providing an additional tool for the detection and location of human remains.

Human skin has been shown to possess reflectivity in the short-wave infrared (SWIR) region of the electromagnetic spectrum. As a result, a research study was designed to investigate the reflectivity of human skin in the (SWIR) region of the spectrum using a hand-held infrared spectrometer. The goal of the study was to use the infrared spectrometer to collect reflectivity data from the skin of a wide range of humans and from tree canopy to assess the feasibility of using a portable SWIR system to recover human remains. Prior to the collection of the skin reflectivity data, preliminary measurements were made on fabrics to determine instrument reproducibility. The results from the preliminary measurements suggest that the instrument is reproducible since the signal variation was less than five percent.

The reflectivity data was collected from the skin, hair, and bones of human remains in the short-wave region of the electromagnetic spectrum to determine the characteristic reflected wavelengths from each type of sample. The data was collected from the human remains housed at the Anthropological Research Facility at the University of Tennessee at Knoxville. The remains were in various stages of decomposition (ranging from one to four years), and all of the measurements were made in situ over a period of several days in order to account for variations in weather. Spectra was collected from both male and female remains. Multiple sample measurements were obtained in order to determine the mean and standard deviation of each sample type. Additionally, radiance measurements were taken from the ground through tree canopy to determine the amount of reflectivity that might be detected from a remote imaging camera. Finally, reflectivity data was collected from foliage and other environmental debris to determine wavelengths of possible interferences. The data was analyzed for consistency and principal component analysis of the data is continuing.

The initial analysis of the data revealed that there are unique and characteristic wavelengths in the SWIR region of the electromagnetic spectrum that will distinguish human skin from tree canopy. Additionally, the data analysis revealed that the spectra collected from human hair are reproducible and are not dependent on variables such as the sex of the individual or hair color. The complete data set will be discussed in the context of the spectral differences between human remains and tree canopy and the ways in which these differences may be used to aid in the search for human remains. Additionally, the relevance of the data with regard to the types of possible environmental conditions and/or interferences will be discussed. For example, a variety of tree leaves were analyzed to determine the effect of species on the analytical

signal in the SWIR region. An initial review of the data suggests that the technique shows promise for using a SWIR system for detecting human remains. Future research will focus on the determination of the key spectral parameters that will be useful for further field testing using a remote system for detection.

Human Remains, Infrared Spectra, Remote Sensing

D34 Hyperspectral Imaging of Post-Blast Explosive Residues

Diane K. Williams, PhD, Federal Bureau of Investigation, 2501 Investigation Parkway, Quantico, VA 22135; and Kerri Lynn Moloughney, BS, Oak Ridge Institute of Science Education, 2501 Investigation Parkway, Quantico, VA 22135*

After attending this presentation, attendees will gain a deeper understanding of the use of hyperspectral imaging systems to detect explosive residues.

This presentation will impact the forensic community by providing the explosives analyst with an additional tool to detect and visualize explosive residues on variety of substrates.

Hyperspectral imaging (HSI) allows for the conversion of spectra into image information, allowing visualization through a much wider range of wavelengths than is possible with other imaging methods. As compared to multispectral imaging, which has a single-digit order-of-magnitude wavelength range, HSI can record images over hundreds of wavelengths with very narrow bands. A highly specialized hyperspectral camera has previously been used to detect explosives on fabrics.^[1] Based on these results, a study was initiated to detect and identify post-blast explosive residues using this hyperspectral system.

Post-blast residues present a different challenge from the previous work, due to various environmental factors. Debris, dirt, and human contact can all have an effect on the spectra of the residue. Control samples of explosives were provided by the FBI Explosives Unit and analyzed to determine the key wavelengths where spectral characteristics may be useful. Hyperspectral images were taken of samples obtained from an explosives demonstration. A range of explosives were detonated outdoors, and many of the samples obtained had dirt and debris on them. A variety of substrates was chosen to test, including plastic, wood, metal, concrete, fabric, paper, tape, and glass. All of the samples were collected immediately after the blast, placed into separate containers and appropriately labeled.

The data set represents three dimensions, two spatial and one spectral. Scans of wavelengths ranging from 400-950 nm collect a complete spectral profile for each pixel in the two dimensional image. The "data cube" constructed enables the user to determine the precise location on the image from which a particular spectrum was obtained. This spectral profile also allows visualization of chemical differences on the image itself. Using image processing software, specific spectral characteristics are isolated and illuminated during post-processing. The data will be presented in the context of both detection and visualization of the post-blast residues. A discussion of the reproducibility of the data will be included.

Based on the previous results obtained, it is hypothesized that the hyperspectral imaging system will provide the desired information regarding the key spectral wavelengths for visualization of the residues on a variety of substrates. A long-term study will follow the initial study to determine the effect of aging on the chemical signatures of the samples as well as a reproducibility study. Upon completion of the data set, these key spectral wavelengths will be used to develop a protocol for the detection and visualization of post-blast residues on a variety of substrates. The protocol will be particularly useful because hyperspectral imaging is a non-destructive analytical technique and

allows for simultaneous detection and visualization, even when the residues are invisible to the human eye. Additionally, hyperspectral imaging cameras can be used for remote sensing; therefore, the research will be expanded to include the testing of the protocol for remote sensing capabilities.

Reference:

¹ Williams, D.K., Ayub, H., "Detection of Explosives by Hyperspectral Imaging", 234th Meeting of the American Chemical Society, Boston, Massachusetts, August 19, 2007.

Explosives, Hyperspectral Imaging, Remote Sensing

D35 Age and Gender Differences in Suicide Trends in Puerto Rico: 1999-2007

Enid J. Garcia-Rivera, MPH, Puerto Rico Department of Health, PO Box 70184, San Juan, 00985*

After attending this presentation, attendees will learn about demographics, age, and gender-specific differences in suicides in Puerto Rico from 1999 to 2007.

This presentation will impact the forensic community by showing the changes in suicide trends, and the age and gender specific differences provide forensic and public health officials important information for the identification of high risk populations and the development of targeted public health interventions.

Suicide is an important public health problem throughout the world. Approximately one million people committed suicide every year, with a global increase of 60% in the last 50 years. In 2004, suicide was the 15th leading cause of death in Puerto Rico and the third leading cause of death among males ages 15 to 29. With the purpose to further understand changes in the frequency and distribution of suicides in Puerto Rico we evaluated suicide trends by age, gender, method, and geographical distribution from 1999 to 2007.

Annual suicide data were obtained from all cases investigated at the Puerto Rico Institute of Forensic Sciences (PRIFS) from 1999 to 2007. PRIFS receives all suspected suicides from Puerto Rico for investigation. Descriptive statistics were used to characterize the study population. U.S. Census population estimates were also used as denominators in suicide rates calculations. Suicide mortality rates during the nine-year period were age-adjusted to the 2000 standard population for Puerto Rico and stratified by gender and age for analysis. The annual percent change (APC) from 1999 to 2007 in suicides rates was calculated.

From 1999 to 2007, the PRIFS analyzed 52,122 cases of which 2,792 (5%) were classified as suicides. The mean annual number of suicides was 310 per year. The age-adjusted suicide mortality rates ranged from 8.5 per 100,000 population in 1999 to 7.9 per 100,000 population in 2007. No significant changes on the suicide rates occurred during the study period (APC -0.35, no statistically significant). The mean suicide rate for males was seven times the rate for females (14.6 suicides per 100,000 population vs. 2.0 suicides per 100,000 population, respectively). Most suicides occurred in persons from 25 to 54 years (57%). However, the cumulative suicide mortality rate was highest in persons older than 75 years (28 suicides per 100,000 population) followed by persons aged 45 to 54 years (24 suicides per 100,000 population) in both genders.

Overall, the method most commonly used to commit suicide was hanging (64.5%), followed by fire arms (14.1%), solids or liquid poisoning (13.4%), jumping or falling (2.7%) and burning (2.7%). Gender-specific analysis showed that although hanging was the preferred method for both men (67.4%) and women (44.3%), the second most common method for men was fire arms (15.3%) vs. poisoning (32.1%) for women.

Higher suicides rates than the expected for the population (>7.9 cases per 100,000 population) were observed in several rural and low-income municipalities in Puerto Rico.

Although the rates of suicide in Puerto Rico have remained stable from 1999 to 2007, gender and age specific differences were identified. Understanding changes in suicide trends and the age and gender specific differences provides forensic and public health officials important information for the identification of high risk populations and the development of targeted public health interventions. In addition this presentation will impact the forensic community by presenting trends, and age and gender differences in a Hispanic community in the United States.

Suicide, Trends, Hispanics

D36 Voice Stress Analysis: A Comparison of Layered Voice Analysis Instrumentation and Auditors' Judgments in Detecting Deception in a Field Setting

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After attending this presentation, attendees will learn if the truthfulness or deception of criminal suspects is detectable from audio-recorded interviews by instrumental or non-instrumental means.

This presentation will impact the forensic community by highlighting concerns about the use of voice stress analysis as a means of detecting deception for forensic and other purposes in the law enforcement community. In addition, what these findings suggest about the interpretation of research reports on voice stress analysis will be considered.

There are two points of information attendees should take from this presentation. First, it is possible to detect the "deception" of criminal suspects from audio-recorded interviews. Second, such auditory detection rates may exceed those obtainable with commercially available "voice stress analysis" devices. Attendees will learn that this latter point raises a concern regarding forensic and law enforcement use of such devices and of the value of some of the evidence advanced in favor of their use.

In this study, two highly experienced interviewers (serving as auditors) were provided with audio-recorded interviews (about 25 minutes in length) of 73 persons who were suspected of involvement in criminal events being investigated by a police agency. When evaluating the audio files each auditor rendered three decisions. First, after listening to the initial portion of each file, a decision of "truthful" or "deceptive" was made; this decision was based on the interviewee's responses in the first several minutes of the interview. Second, at the conclusion of the entire interview each auditor again rendered a decision of "truthful" or "deceptive" (auditors were asked to render only dichotomous decisions, that is, not to use "inconclusive" judgments as is sometimes the case in research of this nature). Following this latter decision, each auditor indicated the degree of confidence in the final decision. This was indicated on a 10-point scale, ranging from "1" no confidence to "10" almost certain. Statistical analyses were carried out using as dependent variables the auditors' truth/deception decisions and the confidence scores.

The sample of audio files used in this study was drawn from digital audio recordings of the pre-test interview segment of polygraph examinations. These interviews were collected by a police agency for the purpose of evaluating one of the commercially marketed voice stress analysis devices. Two persons employed by this police agency

underwent the standard "Level 1" 40-hour training program offered by promoters of the voice stress analysis device. Each of these persons carried out blind analysis of the audio files using the voice stress analysis device. The voice stress analysis device results were used to judge if the interviewee was "truthful," "deceptive," or "inconclusive." This latter result indicated that the voice stress analysis device was unable to render a definitive outcome.

The voice stress analysis device decisions and the judgments rendered by the two auditors of the interviews were compared to two different ground truth criteria. The first criterion was, as is common in such research, a confession which implicated a "guilty" person and, in some instances, exonerated an "innocent" person in the same case. The second criterion was the result (that is, the decision yielded by analysis of the polygraphic data) produced by one of two commercially available computerized scoring systems (algorithms). The result of these algorithms, of course, provided a criterion that was free of the influence of examiners' assessment of the polygraphic data.

The results to be reported include the accuracy of the auditors' and the voice stress analysis device decisions. Also, the relationship of the auditors' decisions to their confidence and to characteristics of the suspects and the cases will be considered. Finally, the discussion will highlight what these findings suggest about research reports which are said to support the effectiveness of voice stress analysis as a means of "lie detection."

Voice Stress, Deception, Police Interviews

D37 Measuring Typicality in Speech Features in American English Dialects: Towards Likelihood Ratios in Speaker Recognition Casework

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After attending this presentation, attendees will be informed about work in speaker recognition.

This presentation will impact the forensic community by describing new methods being developed to measure the typicality of certain features in American-English dialects.

This presentation will focus on new methods that are being developed to measure the typicality of certain features in American English dialects. The presentation will demonstrate the ongoing development in speaker recognition analysis. These methods have been enhanced by a growing knowledge of what is typical for various dialects in American English. The goal is to eventually build a large annotated corpus sufficient for establishing dialect norms for a variety of linguistic phenomena. It is hoped that such a corpus will assist forensic phoneticians and sociolinguists to quantify variation between and within American English dialects. It is also believe these methods will improve technologies for automatic dialect identification and automatic speaker recognition.

Claims about speaker recognition vary across multiple methods. In the field of forensic phonetics, applied phoneticians routinely identify speakers from phonetic characteristics that are hypothesized to be speaker specific.

Quantifiable norms of language- and dialect-dependent features are necessary for forensic examiners to assess if a given phonological or phonetic feature is speaker specific or commonly found in that speaker's dialect. To obtain these norms, detailed annotation of large sets of

speech data must take place. This research utilizes rapid, semiautomatic annotation techniques of detailed phonological and morphological phenomena for large-scale speech corpora. Resulting annotations and corpora will support both large-scale linguistic dialect analysis and automatic dialect identification.

The techniques used in the detailed annotation of large-scale speech corpora will be described in detail. "Regions-of-interest" (ROIs) were used, where an annotator is asked to make a judgment of whether or not a certain transformation of a given feature occurred in orthographically transcribed data. Transformations from General American English to a specific dialect are based on rules of occurrence in the specific dialect. These transformations are currently phonetic only and are among the most commonly occurring in spoken dialects of American English. Morphological rules will be applied at a later date. Phonetic rules were developed by a team of sociolinguists and sociophoneticians. The use of ROIs, together with an annotation tool, allows a large amount of data to be processed in a shorter amount of time. The output of these judgments is a likelihood ratio between speech samples. With enough judgments from the speech corpora a measure of typicality can be used, allowing for likelihood ratios between speech samples and compared against a given population.

The ROI method has been carried into speaker recognition casework for testing purposes. Each case starts with a detailed orthographic transcription. The transcription and original audio are processed to create a file where the audio is aligned with a transcript that contains a word layer and a phone layer. Once the transcription is checked for errors the word and phone layers are fed into a tool to generate ROIs based on the above-described rule-development process. The ROIs are then judged by an expert examiner in a different tool. It was found that the process must be carried out by expert examiners with backgrounds in linguistics and phonetics since judgments must be informed and interpretation of output is highly technical in nature. The presentation will lay out each step in the analysis procedure from raw audio to final conclusion.

Speaker Recognition, Likelihood Ratios, Linguistics/Phonetics

D38 How to Train a Facial Recognition Examiner

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After attending this presentation, attendees will have an understanding of biometric facial recognition and the disciplines that a forensic examiner should know to perform facial comparisons.

This presentation will impact the forensic community by giving a brief overview of biometrics and the state of the art in facial recognition. In addition, the work will outline the important topics used in training forensic examiners to perform facial comparison examinations.

The recent increased availability of automated facial recognition systems appears, on the surface, to be a boon to law enforcement. However, the accuracy of these systems varies greatly, particularly when dealing with real-world surveillance images. Therefore law enforcement must be careful that facial recognition systems do not lull the community into false security. No facial recognition system, for private or government use, is ready to be run 'lights out' and provide accuracy rates acceptable for the judicial system. Thus the output of any facial recognition system must be verified by a human examiner. This can be accomplished in the field, e.g., by a police officer comparing the output of an automated system searching a database of arrest photos to the subject the officer has just pulled over. This verification can also be accomplished in a forensic lab, e.g., by an image analyst performing the one-to-one comparison of the output of a facial recognition system to the

subject observed in a surveillance video. These practices are akin to using the IAFIS system, where latent print matches from the system are generally checked by forensic examiners. However, unlike in the fingerprint community where there were already numerous fingerprint examiners working, such that automation decreased the number of examiners needed, the facial identification community is exceptionally small, where most forensic labs do not have image analysts trained to perform these comparisons. Therefore, automated facial recognition will actually increase the number of facial identification examiners needed. These forensic examiners will need sufficient training to compare human faces and have the results accepted in a court of law.

Facial comparison examinations have been performed at the Federal Bureau of Investigation for at least 40 years; FBI examiners have testified in court to such comparisons nearly as long. The training that goes into forensic facial comparison examinations is robust. The training curriculum used by the FBI includes the following key topics: the anatomy of the human head, the nature of aging and alteration, the principles of imaging science, the scientific principles of comparison, and the methods of comparison. Each of these topics can be further subdivided into critical areas. For example, anatomy of the head includes learning the bones of the skull, muscles of the head, dermatology of the head, and properties of the ear. Image science is a necessary component that includes areas such as understanding image processing, compression, and resolution, and also awareness of perspective, illumination, and optics. The combination of these topics allows the examiner to have a broad knowledge base, to assist in performing the comparisons. The curriculum also includes the history and legal basis for such comparisons, to assist the examiner in testifying in court.

This work will present a brief overview of biometrics and the state of the art in facial recognition. In addition, the work will outline the important topics used in training forensic examiners to perform facial comparison examinations.

Biometrics, Image Analysis, Facial Comparison

D39 Forensic Logistic Laboratory Process of the Mass Fatality Utilizing the Supply-Chain Operations Reference (SCOR) Model

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After attending this presentation, attendees will understand the use of a logistical process based off of the Supply Chain Reference Model that can be used in a forensic laboratory of any mass grave or mass fatality.

This presentation will impact the forensic community by showing how a logistical process can be implemented into a forensic laboratory processing a mass grave or mass fatality. Attendees will clearly understand the logistical process that includes physical evidence and documentation flow, efficiency allocation of resources, leveraging of participant's qualifications, utilizing the process to maximize efficiency, and measuring process flow.

Both mass fatalities and mass graves require a very organized logistical method to efficiently and effectively process these types of events. The literature on mass graves extensively covers archaeological methods for proper field and excavation procedures utilized in mass fatalities/graves. However, little is found in the literature on operating procedures at a mass grave or mass disaster within the forensic laboratory. To produce accurate information with little or no compromise of evidence, and to combine the laboratory data to the data collected from the field, it is critical that there is a detailed and specific

laboratory process in place and that the laboratory be managed by an individual or individuals that are experienced in logistical processing.

In this presentation, the intent is to introduce the concept of utilizing the Supply Chain Operations Reference (SCOR) model in a forensic laboratory process of any mass fatality/grave and to take components within the supply chain model, define and build them into the development of a forensic logistical process. The SCOR model describes logistical principals that can be implemented without compromising accuracy, efficiency and chain of custody requirements. The presentation will focus on the specific steps in the SCOR model that correspond to the forensic laboratory process. This will include physical evidence and documentation flow, efficiency allocation of resources, leveraging of participants qualifications, utilizing the process to maximize efficiency, and measuring process flow.

Using the model in a similar manner as used in business applications, this model will provide a high level understanding of evidence flow through a forensic laboratory. This high level view provides the flexibility for varying applications, but provides a rigid outline for the understanding of sequential and dependent events. In addition, the distinction between the flow of evidence and flow of documentation will help to understand the importance of implementing this model in a mass fatality/grave scenario.

In a forensic scenario, there is a higher sense of purpose within the processing which can stimulate the efforts and willingness of participants. Participants are willing to perform many duties for the greater good of the mission, regardless of what the duty might be or how it affects the complete process. This however, can be detrimental to the successful completion of the project. Participant's willingness to perform many of these tasks cannot alone, carry the successful processing and completion of the mass fatality/grave.

If all mass fatalities have a similar structured logistical process, universally accepted (such as the SCOR model) it will provide predictable and comparable information that can be analyzed and used to establish a benchmark standard. Government or non-government organizations that fund mass grave/mass fatality endeavors will be able to measure efficiency, to determine if they are within budget and within the time frame for the project.

Supply Chain Operations Reference Model, Mass Graves/Fatalities, Logistical Process

D40 SOBER: A Virtual Collaboratorium for Synchronous Online Biomedical Education and Research

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The goal of this presentation is to demonstrate new technologies that have successfully enabled interactive real-time collaboration and teaching between researchers, experts, trainees, and forensic agencies in a virtual environment, as well as provided a forum for forensic experts from around the world to meet and collaborate without requiring close physical proximity.

This presentation will impact the forensic community by gaining

scientific knowledge of new technologies and methods, ultimately improving access to resources and opportunities for research normally impeded by geographic location. Advantages include the ability for law enforcement to choose experts based on suitability rather than propinquity, and for students to access a wide range of teaching collections and experience housed in multiple institutions.

Current telecommunication technologies have provided a means for forensic researchers and professionals to conduct research and provide educational training beyond actual physical contact.^[1] Collaborators at the Universities of South Florida and Liverpool John Moores University have instituted a pilot program, the SOBER (Synchronous Online Biomedical Education and Research) Collaboratorium, that has been enhancing teaching and learning through virtual classroom and laboratory environments. This technology has also been used to conduct research collaborations through synchronous sessions with international experts via the internet.

Remote technologies have been explored in the medical field for clinical, research and military purposes. Over the course of a year, an international team of researchers were able to collaborate on forensic research and casework, while testing different methods of online remote telecommunication tools. A software package, that is an online, educational and collaborative program that allows for real time communication for multiple users ranging from simple one on one interactions to mass communications consisting of groups of 200 or more. One of the strengths of the software is that it is not bound to any specific computer platform, level or internet connection speed.^[1] Synchronous sessions have also provided opportunities for remote use of high end sophisticated imaging software packages utilized by the collaboratorium for three-dimensional modeling, visualization, and analysis.

In the virtual classroom, the researchers have been able to create virtual anatomy and anthropology laboratories using reliable virtual models created by the lab^[2] and then share that content between universities. Lectures and practicals can be conducted simultaneously in both countries and teaching expertise shared using the academic software. This online academic software can be used alongside any online training courses to create a multimedia, interactive environment for the trainees. Students have live access to the instructors no matter where they are located.

In an era of budgetary concerns, it is becoming less feasible for local forensic agencies to obtain access to leading experts from around the country and the world. Virtual collaboration tools will provide the ability for these agencies or institutes to collaborate without having to bring the expert physically to the agency. In this study, data was securely transferred and analyzed on proprietary software by the researchers via remote computer access. Online voice and video conferencing served as brainstorming and feedback sessions for the virtual laboratory.

As the world gets smaller via new communication technologies, researchers will have new opportunities to expand their networking capabilities beyond their local agency, institute, or university. Access and the ability to share these high end resources will prove to be invaluable tools in the progression of scientific research, training and collaborations.

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Computers, Remote Research, Technology

D41 A Review of Forensic Science Programs in the United States

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After attending this presentation, attendees will learn information regarding the characteristics of the bachelor and master forensic science programs.

This presentation will impact the forensic community by providing knowledge of the forensic science education in the United States.

Over the last 30 years, the number of institutions offering forensic science higher education programs has increased from 21 to 120. However, despite an increase in student interest and program availability, there has been a consistent reluctance to hire individuals with degrees in forensic science. This is due in part to a lack of information available about these programs, in terms of course offerings, equipment available to students, degree or certificate requirements, and other important aspects of the programs. Additionally, while accreditation by the Forensic Science Education Programs Accreditation Commission (FEPAC) ensures adherence to certain standards, it is not required. As a result, it is possible for the curriculum of forensic science higher education programs to vary considerably.

To obtain an understanding of the variance observed in forensic science higher education programs and their course offerings and requirements, the existing academic Forensic Science programs in the United States were invited to participate in an electronic survey. The survey requested information regarding the number of courses, subject inclusion, pre-requisites, degree requirements, available instrumental and academic resources, and experience, degree level, and participation of faculty.

It was found that, of the responding institutions, relatively few of them are FEPAC accredited, although most intend to apply or have applied for accreditation. It was also observed that, in general, the responding programs vary considerably in terms of their size and subject coverage.

Following this presentation, attendees involved in forensic science higher education programs will have a greater understanding of the offerings of other institutions, and may subsequently choose to adapt their curriculum such that greater standardization of degree requirements would be possible. This would enable laboratory directors and supervisors to better understand the qualifications of students graduating with a degree in forensic science.

Forensic Science, Education, Standardization

D42 Teaching and Assessing Ethics and Law Within Medical Education: Implications in the Arab World

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After attending this presentation, attendees will gain knowledge on how the quality of medical education is ultimately judged by the ability of its graduates to perform at a high level. Graduates must be able to care for individual patients. They must be able to work effectively, competently, and safely in a diversity of cultural environments. Thereby, graduates must possess a sufficient educational base to respond to evolving and changing health needs throughout their careers. For this reason it was determined that ethics and law should be introduced to students. With the knowledge of ethics and law the students could better understand their own professional and legal responsibilities when working with patients.

Forensic medicine is the medical specialty that links medicine with the law. In today's increasingly litigious society, newly qualified doctors should not start practicing before having received a basic grounding in medico-legal matters. The application of ethics and law to medicine is now an emerging academic discipline with intrinsic and rigorous standards.

The general objective of the course is improving medical care and medical education by building greater awareness and understanding of the moral, ethical and social dimensions of medicine with reference to the law governing some medical conditions. The contents and strategies were in accordance to the global standards of medical education.

The tutoring methods used were lectures, using audio-visual aids as PowerPoint presentations, small group discussion in addition to problem solving and case studies as a form of problem-based learning in realistic clinical cases. The cases emphasize ethics, but also include human behavior, basic science and clinical medicine.

The evaluation strategies were formative assessment, in the form of quizzes to assess intellectual skills, summative assessment in the form of MCQs to assess intellectual skills, and problem solving to assess professional skills.

The contents of the course were eight Instructional Units:

- I. Historical review of the evolution of medical ethics
- II. Basic principles of medical law, medical ethics and health care ethics
- III. Ethical responsibilities of physicians
- IV. Issues related to patient autonomy as Confidentiality, Consent for treatment, Brain death (definition, criteria), and Ethics of organ transplantation from living and dead in addition to Euthanasia (active, passive, assisted suicide, withholding resuscitation)
- V. Ethics of Reproductive Medicine and the legal condition of the fetus
- VI. Medical documentation (Medical Records)
- VII. Legal responsibilities of physicians and Malpractice (definitions, elements and basis of evaluation)
- VIII. Ethics of medical research, related to the research itself or to the subject of research, whether human, animal, tissue, genetic material or fetal tissue

Medical Ethics, Medical Education, Global Standards

D43 The Symbolism in Mafia Homicides: The "Violation" of Mafia's Honor Code

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The goal of this presentation is to show how a mafia homicide, in which the brutality of the crime, is associated with a ritualistic symbol. Symbols and signs are used in many life and societal aspects. They are very important codes, especially in some criminal organizations where they become an advertisement and a warning for all and especially for the experts or "adepts."

This presentation will impact the forensic community by illustrating a case which resulted in death that occurred in Palermo during the eighties. The victim, a male and an "uomo d'onore", was well known in criminal circles. The victim was like a "u cantante" (singer) because his criminal activities were akin to a singer of melodic Neapolitan songs. The victim was found dead, in a little place in

Palermo, with his genitals in his mouth. The autopsy showed that the victim was initially beaten than strangled and after he expired he was emasculated.

“Cosa Nostra”, as the Mafia is defined by “her adepts”, is a criminal organization which was born in Southern Italy, according to some authors, after the Italian unification in 1861. According to historical sources, in the South of Italy (Sicilia, Campania, Calabria), some criminal organizations were already present, originating from the Roman or the Arabian dominations. The progressive expansion of “Cosa Nostra” was increased by the application of new Italian laws. These laws, which forced those in agriculture to divide the fields between farmers, created a progressive discontent amongst the farmers.

The farmers had to pay a tribute (the “*gabella*”) to the few owners of the fields for the privilege of working the fields. The collection of this tax was made by the “*campieri*”, unlike what happened in the other Italian regions. The progressive control of the economy and increased power of the privileged class was established by the relationships they formed with the Statesmen, who resided in their territory.

This first phase was followed by a crisis, during the Nazi-fascist domination between 1920 and 1940. After the liberation of Italy from Nazi-fascist control, “Cosa Nostra” reached its definitive organizational structure in the early seventies thanks to different economic operations (such as control of the drug market, tobacco smuggling, control of business contracts). In order to avoid conflicts of interest, in this phase, the Mafia took on a pyramidal business structure. At the base of this “Cupola” there were men well known as “*uomini d’onore*” (honor’s men, the old “*campieri*”): they are quite the soldiers, totally obedient to “*Capodecina*” a sort of a peripheral chief; all chiefs and soldiers composed the “*Famiglia*” (Family), that has some delegates, called “*Capimandament*.” These delegates gather to decide strategies and actions. Recently, because of the Mafia’s growth and the peripheral expansion, it has created the “*Commissione interprovinciale*”, in order to coordinate its many districts’ actions.

After the rituals of initiation, each member has to comply with some specific rules that constitute the “*Codice d’onore*” (honor code). The honor code states that they must respect the rules of the organization, respect the others (“*uomini d’onore*”), and uphold the obligation of silence about the Organization. Finally their duty to women, especially for those who uphold their family and children are likened to the “man of the state”, like policemen, judges, who have always been “untouchable”.

This presentation illustrates a case of death which happened in eighties in Palermo, in which a man, an “*uomo d’onore*” known in the criminal society circles like “*u cantante*” (singer) for his activity like singer of melodic Neapolitan song, was found dead, in a little place in Palermo. The victim was found with his genitals in his mouth.

The investigations did not identify the killers and the investigators believed that the murder was due to a “*sgarro*” (bad action) due to a courtship of a woman who was from another “family”, and thus was considered untouchable. The gesture of placing the genitals in the mouth was an expression of the will to make the facts known.

The goal is to show (or explain) the structure of Mafia’s organization, its rites and the symbolism used in the Mafia’s use of homicide. Other cases in which the symbolism was linked to the violation of a specific rule in the Mafia’s honor code will be shown.

Mafia’s Honor Code, Emasculation, Signs and Symbolism

D44 Mafia Homicide During the 80’s and Early 90’s (1981-1985 – 1990-1992): The Unusual Use of War Weapons (Kalashnikov AK-47) – An Analysis of Murder Cases in Sicily

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The goal of this presentation is to show how some of the most important murders that were carried out by Cosa Nostra through limited use of the AK-47. Recent investigations sanctioned by the judiciary system have shown that Corleonesi once had a large arsenal stocked with automatic weapons, AK-47s and other weapons from countries of Eastern Europe. Now murders are no longer committed with this kind of weaponry in the Sicilian territory.

This presentation will impact the forensic science community by showing the characteristics of the machine gun, the ammunitions used, and the wounds found on dead corpses.

The 1980s and the early 1990’s were an interesting period in the Mafia’s history which saw the use of weapons never use before (Kalashnikov AK-47).

The use of war weapons was born from the demand of some Mafia families to prove to the Government, and to their adversaries, their “military power.” In fact, before this period, Mafia’s homicides were committed by the use of hunting weapons, “normal” handguns (cal. 38 special/357 magnum) or sometimes a machine gun stolen from the police. Nevertheless, the greatest economic power, obtained from drug trafficking, allowed the most powerful families the opportunity to purchase weapons from countries of Eastern Europe.

The term “Cosa Nostra” usually indicates a criminal organization, located in Sicily, that originated in the beginning of the nineteenth century, and became an international organization in the second half of the 1900s. To mark the change in the structure and methods of the “Cosa Nostra” there was a transition from cigarette smuggling to drug trafficking, which was very profitable. This caused a war inside the Mafia, between the old historic Mafia, composed primarily of some families from Palermo (affiliated to Bontade, to Badalamenti and Buscetta), and the Corleonesi (whose leading members were Luciano Liggio, Bernardo Provenzano, Salvatore Riina, and Leoluca Bagarella). Corleonesi was a really ferocious group, who demonstrated its power by making a series of well-executed murders. These murders were carried out on anyone who might constitute an obstacle, like judges, politicians, policemen and journalist.

In the execution of the classic Mafia crimes, the members would use .38 special caliber pistols or .357 Magnum and 12 caliber shotguns, which were loaded with buckshot (“*lupara*”). At the beginning of the 1980s automatic rifles made their appearance, in particular submachine guns with a caliber 7.62 x39, the model AK 47 and its derivatives (AKM 47). These rifles were used for the first time to murder the leaders of the Mafia’s competition and in the commission of other crimes.

Kalashnikov AK-47, Homicide, Mafia

D45 Denial in Scientific Inquiry and Its Impact on Forensic Science

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After attending this presentation, attendees will understand the means by which the impediments to scientific exploration and

advancement in forensic science can be categorized and examined.

This presentation will impact the forensic community by facilitating the advancement of forensics as a science by providing a philosophical tool for the evaluation of the controversies that surround the emergence of innovative perspectives, groundbreaking methods, or other new ideas and approaches.

Thomas Kuhn contributed greatly to the philosophy of science in describing the purpose of scientific endeavor, how science progresses, and the manner in which scientists respond to emerging theoretical perspectives. His explanation of paradigm shifts in science involved the accumulation of facts counter to the reigning theoretical perspective, the development of new theories to challenge the old, and the eventual adoption or incorporation of the new perspective. In explaining this process, Kuhn presented the problem of denial, but failed to elucidate. Denial exists at each stage of his model for scientific revolution, and the mechanisms by which it is employed must be determined in order to develop a useful understanding of the phenomenon.

Various forms of denial plague the scientific community in general, with its effects expressed on three levels. Denial hampers scientific inquiry by: restricting research and investigative activities either through individual bias, institutional norms, or professional standards; fostering irrational controversies and illogical criticisms to nontraditional work; and preventing or damaging the validation of various disciplines as worthy of consideration as scientific endeavors. These consequences of denial can be seen at all three levels in the field of forensic science. Therefore, the questions that must be asked are: What are the mechanisms of denial? Why do reputable scientists engage in denial? What is the impact to forensic science? In order to answer such questions, the activity of denial in science must be categorized so that its function may be deconstructed and examined.

The use of denial in the realm of science is analogous to the states of denial espoused by Stanley Cohen in his explanation of why good people fail to prevent or otherwise cause bad things to happen. His various forms of denial can be categorized in a matrix by focusing on two issues, the level of knowledge and the level of malice involved in the action or inaction in question. Identification of the amount of malice and knowledge involved in any given act of denial identified the specific category into which it may be placed. Such a matrix serves as a model for examining denial in scientific inquiry.

Scientists have various reasons for their denial of the reality apparent before them. The impact to forensic science is seen in the approaches taken to casework, to education, and to training. Further damage is done in opening the field to criticism from without by other criminal justice practitioners and academics. This paper presents a matrix for the categorization of scientific denial, which may be readily extended to forensic science. In doing so, it also provides a means by which the constraints to scientific endeavors may be countered, and thereby enrich the forensic community with greater latitude while bolstering the community itself. At the heart of this discussion is the argument that philosophy should not only be a part of forensic science, it is a critical component.

Philosophy of Science, Bias, Research Reliability

GENERAL

D1 25 Years of HITS: An Analysis of 10,000 Murder Cases From 1981-2006

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The goal of this presentation is to enable the police and the public to better understand the risk of victimization from a murder and the complex nature of these types of investigations.

This presentation will impact the forensic science community by providing valuable information and topics to be further explored relating to murder investigations.

This paper provides an overview of descriptive information about the victims, offenders and other factors affecting murder investigation solvability by examining variables in the Homicide Investigation Tracking System (HITS) from 1981 to 2006 dataset. Characteristics of the victims and offenders will be examined, including a description of the victim-offender relationship. Information relating to the victim's cause of death and offender's crime scene behavior will also be presented. The HITS dataset used for analysis includes more than 10,000 murders in Washington State and the surrounding area between 1981 and 2006. The HITS data were collected from municipal police departments and county sheriff's offices in close proximity to the Seattle metropolitan area with a service population of 100,000 or more, or that had fifteen or more murders reported to the Federal Bureau of Investigation's (FBI) Uniform Crime Report (UCR) in 1987 (Hanfland et al., 1997). Information on homicides was collected from several states including Washington, Oregon, Idaho, Alaska, and parts of Canada.

The findings from this research provide valuable information relating to murder investigations which should be explored in further detail. In addition, the information obtained from this preliminary analysis of the HITS 1981-2006 dataset will prove useful for law enforcement personnel investigating murders. It is imperative that data from murder investigations be further explored in order to give police a larger arsenal of investigative tools and parameters for murder investigations. The information in this presentation is a valuable resource which will enable the police and the public to better understand the risk of victimization from a murder and the complex nature of these types of investigations.

The current study attempts to answer four general questions prompted by previous homicide research: (1) which demographics are related to case solvability, (2) can case solvability be correctly predicted from knowledge of the victim and offender's age, race, gender, relationship, the time between murder incidents, and distance between murder incident sites, (3) if case solvability can be accurately predicted, which predictor variables are essential to status prediction, and (4) how good is the model at correctly predicting case solvability? While this study is by no means an exhaustive examination of all solvability factors in murder investigations, it provides information on over 10,000 cases and highlights predictors of murder solvability. Logistic regression is used to determine which variables are accurate predictors of case solvability. In general, it is expected that race, gender, age, time, and distance will have a significant impact on case solvability in murder investigations.

Because of the public fear of stranger crimes, solvability will also be examined by victim-offender relationships in this sample. There may be significant factors in case solvability depending on the nature of the relationship between the victim and the offender. Initial findings that the age, sex, and gender of both the victim and the offender effect case solvability are not surprising. The confirmation that the time elapsed and

distance between murder incident component pairings affect case solvability would be consistent with previous findings by Dr. Robert Keppel (1992).

Homicide Investigation Tracking System (HITS), Solvability, Murder**D2 Modes of Killing and Rituals in Apulian Mafia Homicides**

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The goal of this presentation is to show a series of murders committed by the local Mafia in Puglia (Apulia) (Sacra Corona Unita: United Holy Crown), in order to analyze the particular ritualistic aspects of murders and the different manners of execution.

This presentation will impact the forensic community by showing the ferocious manner of killing and rituals used by affiliated members of Sacra Corona Unita.

The early 1980s witnessed the birth of the *Holy Crown United (SCU)*. This is a Mafia organization, which formed in the south of Italy and is noted for the ferocity of its homicides and the correlating ritualistic methods it used. The name of the organization itself relates to strong mysticism; *Holy*: because its principles are absolute and unchangeable, *Crown*: because its members are bonded together like the beads in a rosary, *United*: because the positions in a rosary are absolute and unchangeable.

The discovery of a considerable number of manuscripts has contributed to support the image of the SCU as an elite criminal organization, which uses rituals for affiliation and killings. The internal structure of the organization is similar to a pyramid, which is articulated on different levels ("minor society", "major society", and "secret society"), the entrance to which is secured only via some "baptism rites" that signify the passage of the subject from a condition of layman to affiliated member.

In keeping with the typical customs of the clan, each affiliated member has a nickname. On this basis are based those rituals related to killings, and in fact it is often possible to find objects and symbols laid next to the dead bodies of the victims, that help both to identify the individual and the killing as that of the SCU. One example was the discovery of the horns of a baby bull next to the body of the son of an affiliated member whose nickname was "the bull" or a rat skull in the clothes of a dead member known as a "sewer-rat".

In this research 83 corpses were examined that had undergone autopsies between 1980 and 2000. Of these corpses, 77 were male and 6 were female. The age of the victims ranged between 21 and 40 years. The bodies are mainly of SCU members, and in some rare exceptions police and law enforcement agencies and other citizens who were accidentally caught in the crossfire. Some of the bodies were found after a period of three years from the official denouncement to the police of a missing person, and were largely discovered thanks to the help and collaboration of SCU member's confessions. The condition of the bodies varies in relation to the date and mode of killing. In particular there were fifty-one "fresh" bodies, thirteen burned bodies, twelve skeletons, and seven adipocere bodies.

The killing and successive burning of the body in cars relate to a symbolic code for all affiliated members of the SCU. It relates to the specific initiation ritual, which states that those who betray the organization will be reduced to ashes. This ritual draws back to the ceremony of affiliation in which an image of a saint (Saint Michel Archangel) was burned. Above all, this technique is a strategy that serves to make it more difficult to determine the identification of the victim and to eliminate all traces left by the executioner.

In other cases killings were followed by body destruction in acids. The most frequent event was the disappearance of the subjects that was supposed to be killed: a homicide without the body buried somewhere in hidden places. These cases were referred as “Lupara Bianca”. Lupara refers to the hunting gun that it is used by the SCU to execute its victims and bianca means white, which refers to the fact that there is no victim to identify.

The antropometric research method was necessary in cases where the body was in an advanced state of decomposition (i.e., burnt, skeletonized, adipocerized). This technique was used to ascertain the race, age, sex, weight, and height of the victim along with individual characteristics (i.e., dental records, scars, tattoos, and fractures), which were determined via photos, radiography and clinical records of suspected victims.

Ballistic investigations were conducted in order to identify the types of arms used, and to determine if the same gun had been used in other executions. By the 83 homicides examined, it was determined that most of the victims were killed by a firearm; only in four cases were fatal lesions sustained by blunt objects and in other three cases death was caused by explosive materials.

In more than a third of the cases (73%), lesions at the head (66 by means of a firearm and 3 by means of another blunt object i.e., stick or stone) were the only marks left on the body; in particular lesions caused by a firearm were found to be located on the back of the head, which is hypothesized that at “the moment of execution”, the victim was on their knees, maintaining a reverent position. In three cases lesions were caused by a powerful firearm able to cause considerable damage to individuals. Moreover the identification of one victim of the SCU was uniquely made via an examination of an isolated patella.

The conclusion of the ballistic investigation on the firearms and munitions used by the SCU evidences the different origins of the firearms (i.e., from Yugoslavia, Czech Republic, China, etc.) confirming the role of the SCU in the trafficking of international arms.

Homicides, Ritualism, Italian Mafia

D3 Cars Gone Wild: Auto-Pedestrian Homicides in Harris County

Luisa F. Florez, MD, Kathryn H. Haden-Pinneri, MD, Merrill O. Hines III, MD, Stephen K. Wilson, MD, Luis A. Sanchez, MD, Sharon M. Derrick, PhD, and Sara N. Chauvin, MD, Harris County Medical Examiner's Office, 1885 Old Spanish Trail, Houston, TX 77054*

After attending this presentation, attendees will become familiar with the concept of pedestrian homicide by motor vehicle collision, and will gain insight into the various features of pedestrian fatalities.

This presentation will impact the forensic community by showing the importance of a thorough investigation into all pedestrian fatalities, even those that may initially seem accidental.

Pedestrian and non-motorized bicycle fatalities constituted 21.4% of all motor vehicle fatalities investigated at the Harris County Medical Examiner's Office over a one year period. The manner of death in the vast majority of these fatalities is classified as accidental in Harris County, including those in which the vehicle driver fails to stop and render aid, the so called “hit-and-run.” While most motor vehicle accidents involving pedestrians are found to be genuinely accidental in nature, a small number are caused by a deliberate, volitional act with the purpose of harming or

killing someone. Without a timely and thorough scene investigation and search for possible witnesses, these cases may be overlooked and/or misclassified.

Over a seven month period, four pedestrian fatalities at the Harris County Medical Examiner's Office were determined to be homicides. In two of the cases, the driver and the decedent were not known to each other, and the cases were initially thought to be accidents. In the remaining two cases, the driver and decedent were known to each other and the cases were initially investigated as potential homicides.

The first case was that of a 25-year-old man whose body was found on a roadside near a sewer drain at approximately 7 a.m. by a passerby. He was last known to be alive the night before by his wife, who reportedly spoke to him on his cell phone as he walked home from a night club. His injuries at autopsy were consistent with being struck by a vehicle, and his postmortem alcohol level was 0.21 g/dL. Houston Police Department investigators noticed a surveillance camera at a business parking lot across the street from which the decedent was found. Although no intentional act was initially suspected in this case, police investigators obtained the video which depicted a car deliberately waiting for the decedent to approach an intersection, and then speeding forward and striking the decedent. Two people were then seen exiting the car, walking up to and stopping near the decedent, then returning to the car and leaving the scene. Because the wallet that the decedent normally carried was missing, robbery was presumed to be the motive of this intentional hit-and-run.

The second case involved a 42-year-old woman who was witnessed to be struck by a black pick-up truck as it swerved off the road along which she was walking. The truck carried her on the hood for approximately 62 feet and failed to stop and render aid. Shortly thereafter, a similar hit-and-run incident involving a black pick-up truck occurred in the Houston area. Collaboration between the medical examiner and the police revealed that a single individual had perpetrated these crimes.

In the two cases involving decedents who were known to the perpetrators, the decedents were struck in the parking lots of night clubs. Both of these events were reported to occur following arguments between the decedents and perpetrators.

Additional features of these four cases as well as features of pedestrian hit-and-run fatalities presumed to be accidental encountered at the Harris County Medical Examiner's Office will be reviewed. Factors such as road type and condition, speed of the vehicle, location of the pedestrian (intersection vs. non-intersection), alcohol/drug levels, age of the persons involved, and the time of day will be discussed with regards to intentional and unintentional pedestrian fatalities.

Although rare, there are occurrences in which a motor vehicle is deliberately used as a weapon against another person. Without a complete and thorough investigation that begins promptly at the time the body is found, the ability to effectively classify the manner of death, as well as gain evidence for effective prosecution of hit-and-run pedestrian deaths, may be impaired.

Hit-and-Run, Pedestrian, Homicide

D4 Female Suicide Victims From Gunshot Wounds to the Head: Investigatory Considerations

Alan Price, MA, Southern Institute of Forensic Science, Regional Field Service Office, PO Box 336433, Greeley, CO 80633*

The goal of this presentation is to provide eight (8) investigative steps for evaluating females who are shot in the head and determining that their manner of death is unequivocally a suicide.

This presentation will impact the forensic community and/or humanity by demonstrating investigatory considerations when investigating suspected female suicides by gunshot to the head.

This presentation focuses on investigative strategies for examining cases where female victims are found with a gunshot to the head and suicide is considered the manner of death. Families of female victims who commit suicide in this manner have more difficulty accepting this as a cause of death than others. Investigation of female victims who have sustained a gunshot to the head should be approached with extreme vigilance and an aura of suspicion.

Data collected from the Center for Disease Control and the National Center for Health reflects that the number of suicides has remained relatively consistent from 1990 thru 2004. Groups that collect and analyze suicide statistics identify data as to the means of suicide, i.e., firearms, poisoning hanging, etc., however, they do not specifically indicate the location of the fatal wound. Even though the method of suicide for women vary, gunshots are not the most common method, yet it is not an uncommon method. Suicide by women shooting themselves in the head does occur, however, even though rare, this is seen. This presentation proposes eight investigatory procedures which should be considered in documenting these cases as suicide and not a homicide.

1. **Position of victim:** If the victim is evaluated by emergency responders, and it is determined that she is deceased, every effort should be made to leave the victim in the position in which she is discovered until documentary photographs are taken. This initial step can save investigators literally hours of investigative reconstruction.

2. **Bloodstain patterns on hands:** Victims that succumb to self-inflicted gunshot wounds to the head are likely to have either high or medium back spatter on their hands. This can be photographed and preserved by placing paper bags over the victim's hands prior to transportation from the scene.

3. **Gunshot Residue collection:** Again by placing paper bags on the victim's hands, the death investigator is minimizing the possible loss or contamination of gunshot residue. This step should be initiated as soon as possible and before the victim is transported from the death scene. The paper bags should be retained as evidence and entered into a chain of custody for later examination of trace evidence.

4. **Examination of the gunshot wound:** Careful consideration and examination should be given to the victim's gunshot wound prior to autopsy prepping. Checking the gunshot wound for muzzle impressions, searing, and/or the presence of stippling can later be used to determine distance from the entry wound to the weapon's muzzle. Pre-autopsy examination can also support the medical examiner's findings. High quality photography is imperative to document the presence or lack of searing, soot and stippling.

5. **Radiograph of victim's skull:** Radiographs of the victim's skull are imperative. These x-rays may identify the location of the bullet and any trauma that is associated with the gunshot would itself.

6. **Complete examination of the victim's "home environment":** This investigation activity is likely to require a family members consent or a warrant from a court describing that additional investigation is need to positively establish the manner of death. Since many suicides are committed in settings away from home, frequently preparatory activities take place at a different location than where the victim actually commits suicide. These activities include acts such as computer entries on the topic of suicide, receipts for purchasing the firearm, suicide notes, or instructions to be implemented after the victim's death.

7. **Comprehensive psychosocial autopsy:** Suicide literature contains many components that should be considered in a psychological autopsy. Investigators should not only examine the victim's mental state preceding death, i.e. depression, but the social circumstances that contribute to their mental state. The death investigator should look for 'landmarks' such as the 'anniversary dates' of the death of a loved one, divorce, the diagnosis of a terminal illness or changes in the victim's financial circumstances. A comprehensive psychosocial autopsy can answer many of the families' questions, and make the death determination an unequivocal suicide.

8. **Firearm examination:** In many jurisdictions law enforcement responding to a suicide will take responsibility for entering the weapon used in the death into the chain of custody. Who examines the firearm and

how the weapon is analyzed varies considerably. Some forensic laboratories will not examine weapons used in a suicide, because suicide is not classified as a crime in that State. Ballistic comparison can also be conducted to compare a bullet from the victim or the death scene with the gun used in the death.

These guidelines are proposed when females are discovered with gunshots to their head and that the comprehensive investigation differentiates suicide from homicide. Victim's families have difficulty accepting this manner of death when the victim is shot in the head. These procedural guidelines help assure families that every investigative avenue was explored before concluding that this act was in fact a suicide and not a homicide.

Female Suicides, Head Gunshots, Investigative Procedures

D5 A 10 Year Epidemiologic Review of Homicide Cases in Children Under Five Years Old in Fulton County, Georgia: 1996-2005

Geroncio C. Fajardo, MD, and Randy L. Hanzlick, MD, Fulton County, Medical Exam Center, 430 Pryor Street, South West, Atlanta, GA 30312*

After attending this presentation, attendees will know the epidemiology of homicide deaths certified by the Fulton County Medical Examiner's Office from January 1, 1996 through December 31, 2005 in children under five years of age and who were Fulton County residents, and they will be able to determine if the observed cases of homicide deaths among children under five years of age in Fulton County are significantly greater than expected when compared to the State of Georgia.

This presentation will impact the forensic community by enabling the local and state government officials to recognize the epidemiology of children at risk, to help them allocate limited resources efficiently, and to implement preventive measures to at-risk populations effectively. Furthermore, this presentation will enable the forensic community to recognize the continued need to collect current and accurate data on child abuse homicides and to conduct further study to determine the reasons for homicide in children under five years of age.

The primary purpose of this study is to present the epidemiology of homicide deaths certified by the Fulton County Medical Examiner's Office from January 1, 1996 through December 31, 2005 in children under 5-years-old. The secondary purpose of this study is to determine if the observed cases of homicide deaths among children under 5-years-old in Fulton County are significantly greater than expected when compared to the State of Georgia. For purposes of this study, only homicide deaths of Fulton County residents were included.

All homicide cases in children under 5-years-old were reviewed: infancy (less than 1 year old) and early childhood (1-4 years old). Chi-square values were calculated using Epi Info to determine differences in homicide among age group, race and sex variables. In addition, a chi-square test at the $\alpha=0.05$ level was done to determine if the observed cases of homicide deaths among children under 5-years-old in Fulton County were significantly greater than expected when compared to the State of Georgia.

There were 49 homicide cases in children under 5-years-old identified over this 10-year period. The yearly distribution of these 49 homicide deaths ranged from one death in 2003 to nine deaths in 2004. Most of the cases were male (n=29, 59.2%) and black (n=44, 89.8%). Between infancy and early childhood cases, homicide victims were nearly equally divided between the two groups. However, chi-square values showed that decedents under 5-years-old are 1.7 times more likely to have died of homicide compared to decedents 5-years-old or older (OR = 1.74, 95% CI = 1.29-2.35). Black decedents < 5-years-old are 3.2 times more likely to have died of homicide compared to other races (OR = 3.21, 95% CI = 1.21 - 9.28). Male decedents and female decedents are equally at risk to have

died from homicide (OR = 1.14, 95% CI = 0.61 – 2.11). It was also determined that the total homicide risk for children under 5-years-old in Fulton County during the years 1996-2005, at the $\alpha=0.05$ level, is 1.8 relative to the State. Brain injury was the primary cause of death in majority of the cases (n=23, 46.9%). Although this study was unable to collect information on the victim's suspect/offender characteristics, it was noted that only 37% of the cases (n=18) went to trial. Majority of the homicide investigations were under the Atlanta police jurisdiction (n=28, 57.1%).

Results from this study may assist Fulton County and its various cities as well as the State of Georgia in recognizing the epidemiology of children at risk to help them allocate limited resources efficiently and implement preventive measures to at-risk populations effectively.

Homicide, Children, Under 5-Years-Old

D6 The Diagnostic Value of Doll Reenactment for the Investigation of Sudden Unexplained Infant Deaths

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The goal of this presentation is to demonstrate the contributions of doll reenactment in the investigation and certification of sudden unexplained infant deaths (SUID).

This presentation will impact the forensic science community by showing how doll reenactments are important in documenting the infant's position as well as their physical relationship with environmental factors and co-sleeping companions. This evidence based practice allows the forensic pathologists to better visualize first responder observations and therefore provide more reliable death certification.

The Centers for Disease Control and Prevention (CDC) has found that the decline in sudden infant death syndrome (SIDS) rates since 1995 have been offset by increasing rates of other types of sudden unexplained infant deaths (SUID). A recent review by the Medical Examiner Office in Wayne County, Michigan where doll reenactments are routinely performed during SUID scene investigations, suggests that asphyxia plays a greater role in many sudden infant deaths than has been previously reported. Co-sleeping continues to be a significant risk factor involved with SUID. Doll reenactments are important in documenting the infant's position as well as their physical relationship with environmental factors and co-sleeping companions.

The CDC has identified scene reconstruction using a doll to depict both "placed" and "found" positions as important in SUID investigation. It is suggested that doll reenactment allows the forensic pathologists to better visualize first responder observations and therefore provide more reliable death certification. However, death investigators, law enforcement professionals, and medical examiners remain reluctant to perform or dismiss doll reenactments because of emotional concerns for the parents and for themselves. Using an evidence-based model, this study documents the contributions of doll reenactment in the investigation and certification of sudden, unexpected infant death by the Milwaukee County Medical Examiner Office in Milwaukee, Wisconsin.

Beginning in June 2005, the Milwaukee County Medical Examiner Office implemented CDC's doll reenactment protocol as a routine component of pediatric death investigation. This review examines the contributions of doll reenactment in determining the cause and manner of death in cases from June 2005 through May 2007 in comparison to the previous two-year period during which doll reenactments were not

performed. Initial findings indicate an increase in the percentage of deaths certified as accidents with a corresponding decrease in the percentage of deaths certified as undetermined. Co-sleeping was a risk factor in approximately 60% of all SUID cases reviewed.

Doll Reenactment, Sudden Unexplained Infant Deaths (SUID), Co-Sleeping

D7 Assessment of Living Siblings While Conducting a Comprehensive Child Death Investigation

Joyce P. Williams, MFSA, and David A. Williams, DDS, Allegany Dental Care, 26 Grove Creek Circle, Smithsburg, MD 21783*

The goal of this presentation is to describe the essential components that must be considered in child death investigations. It will analyze procedures to determine children at risk for abuse and the collaborative components of a forensic multidisciplinary team. The presence of physical and mental injury will be demonstrated and the outcome from a case review.

This presentation will impact the forensic science community and/or humanity by demonstrating the need to conduct a thorough investigation to ascertain the entirety of the circumstances surrounding the death of a child and to determine if risk is present to associated children in the home to further protect them from harm.

Death by unnatural means require the death investigation team to research the historical components, the scene, and social history and along with the forensic pathologist's findings to determine the cause and manner of death. Child deaths command a thorough assessment of the home environment to determine risk in the remaining siblings. The following case will provide details of serious injury in two children subsequent to the death of their brother.

Potential sexual assault was suspected during the forensic investigation of a three year old male who was dead on arrival to the emergency department. Findings noted were the presence of petechia and anal dilation. Final autopsy reported cause of death to be asphyxiation due to cohabitation during sleep and the manner of death was ruled accidental.

The case was investigated by the Child Advocacy Center (CAC) in conjunction with the Department of Social Services (DSS) and local law enforcement. Child protective services, part of the multidisciplinary team at the CAC initiated a risk assessment on the siblings remaining in the home. A five-year-old male and an eight-year-old female were temporarily removed from the home pending the outcome of the investigation. Forensic interviews were conducted using the Finding Words protocol on both children. Each was referred for forensic medical examinations.

The medical examination was conducted by a forensically trained pediatrician and a forensic nurse examiner certified in adult and pediatric sexual assault. Evidence of injury was found in both children. Additionally, they each exhibited significant psychological stress and trauma. Both children exhibited behavior issues, aggressivity in play and delayed development. Each child was referred for intensive psychological treatment on site by a licensed therapist.

Further investigation provided a background of previous intervention by DSS in another county for neglect. The social history determined the primary care provider was the father who was unemployed and disabled. The mother was employed outside the home during the daytime.

The outcome of the case is permanent removal of both children with the parents relinquishing custody of their children to the state. Current status of the female is ongoing intensive therapy in a state mental facility. The male sibling resides in a group home for boys with all efforts exhausted for foster placement.

Child Death Investigation, Forensic Nurse, Child Abuse

D8 Forensic Aspects of Suicides and Multiple Gunshot Wounds

Gilles Tournel, MD, PhD*; Cédric Houssaye, MD, Axelle Balgairies, MD, Anne Becart-Robert, DDS, Valéry Hedouin, MD, PhD, and Didier Gosset, MD, PhD, Institut de Medecine Legale, Faculte de Medecine, Lille 1 place de Verdun, 59045, FRANCE

The goal of this presentation is to find common features in multiple gunshot suicides and to explain the suicidal action in these multiple gunshot suicides.

This presentation will impact the forensic science community and/or humanity by illustrating the difficulties encountered by the forensic medical doctor to explain homicide or suicide.

Introduction: Suicidal gunshots are generally intended to kill rapidly. Therefore, the head and the thorax are the targets in the majority of the gunshots in suicides cases. Sometimes, some people who commit suicide are able to fire two or more gunshots to these body regions. In a 5-year study of 60 autopsies of clearly-defined gunshot suicides, five persons (6.5%) fired two or more gunshots to the body. Among these five cases, one case involved a combination of gunshots to the chest and abdomen and one gunshot to the head without immediate incapacitation. The trajectories were restricted to the chest for the three other cases. The goal of this presentation is to find common features in multiples gunshot suicides and to explain the suicidal action in these multiple gunshot suicides.

Materials and methods: The 2000 to 2005 autopsy records of the forensic institute of Lille were checked for clearly defined gunshot suicides. The autopsy record, the past history, the characteristics of the weapon, the toxicology analysis, the scene of death report were available in all the cases and were used to demonstrate the suicidal characteristics in spite of multiple gunshots wounds in the bodies.

Results: *Case 1:* A 40-year-old woman, suffering from a chronic depression syndrome, committed suicide with a 12 caliber rifle. She performed three gunshots in the abdominal area and one in the head. Findings of scene crime and autopsy were used to determine that suicide was intended. These elements are described and detailed. *Case 2:* A 30-year-old police officer committed suicide in his car with his service gun. His suicide occurred in front of other police officers approaching the car; they had been called by his wife. An autopsy was performed in order to confirm the origin of the weapon. Survival time was studied to explain the possibility of these four gunshots. *Case 3:* A 75-year-old man killed his wife with three gunshots and then shot himself six times in the thoracic area. This was diagnosed as a case of post-aggression suicide. *Case 4:* A 35 year-old man killed his son and took his car. The weapon used was a 12 caliber rifle. He committed suicide with the same weapon in his car. During the autopsy, an entrance wound was discovered in back area. The origin of this wound was not due to his rifle; the bullet was shot by policemen chasing the man's car and trying to stop him. The survival time was mentioned and compared to literature. *Case 5:* A 60-year-old man killed himself with two gunshots with a 22 caliber revolver. The reason for the suicide was determined to be financial debt. Crime scene was analyzed and autopsy performed in order to determine the weapon used and if suicide was intended.

Discussion: The incapacitation is important to be considered and a general classification (immediate, late) can be determined and illustrated by the cases presented. The survival time, the type of weapon, the characteristics of weapon (automatic, semi-automatic), the location of the gunshot wounds, the lesions of deep organs observed during the autopsies are described, studied and used to determine a classification in order to differentiate a crime from a suicide. Suicide can only be excluded if immediate incapacitation injuries are caused by more than one bullet. Some aspects as mental or emotional state of the victim, especially the expectancy of being prepared for a hit, have an important role. The autopsy is of course necessary. The amount and the location of tissue disruption must be established with an autopsy in order to estimate the potential for

physical activity following the injury. For long firearms, a comparison between the path of the trajectory and the anatomical features is important. All these aspects are discussed and compared to the forensic literature of multiple gunshots wounds in cases of suicide. A large iconography is associated to illustrate the cases presented.

Gunshot Wounds, Multiple Gunshot Suicide, Incapacitation

D9 The Multidisciplinary, Intercontinental Investigation of an Unusual Homicide/Suicide

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After attending this presentation, attendees will understand the importance of the multidisciplinary approach to a medicolegal death investigation and of "thinking outside the box" when considering potential avenues to pursue in determining the cause and manner of death.

This presentation will impact the forensic community by emphasizing the necessity of considering nontraditional sources of potential information and specimens for laboratory analysis in the investigation of decomposed, mummified, and skeletonized bodies.

The determination of the cause and manner of death in cases that fall under the jurisdiction of the medical examiner or coroner is rarely made by postmortem examination alone, but is most commonly made by the correlation of the autopsy results, scene investigation, and the medical and social history of the deceased, as well as laboratory studies. The investigation of deaths of individuals whose bodies are decomposed, mummified or skeletonized is particularly difficult for medical examiners and medicolegal death investigators, and frequently requires consultation with experts in a variety of disciplines in the forensic sciences, including anthropologists, odontologists, entomologists, botanists and behavioral scientists. In such cases, the investigation of the scene and circumstances of the death may provide the only clues to the cause and manner of death.

The majority of decomposed and skeletonized bodies are found in rural or isolated settings in which the remains go undetected for a period of time. However, we report an unusual case of an apparent murder/suicide involving two individuals and a canine. The deaths of the 63-year-old woman, her 34-year-old son, and the family German shepherd occurred in their home within a residential neighborhood. In spite of the close proximity to neighboring homes, these deaths went undetected for almost four years, as estimated by expiration dates on containers of food in the refrigerator and from paperwork in the house. Eventually, a former caretaker of the property went to the residence after he noticed that the property was being sold by the county because of unpaid property taxes and discovered the bodies, which were mummified and partially skeletonized. The bodies of the male decedent and the dog appeared to have been posed, suggesting that the deaths were not of natural causes. The identification of the decedents necessitated the collaboration of the medical examiner's office, law enforcement, a forensic anthropologist, and a forensic odontologist, as well as Interpol, since the decedents were German nationals who were only part-time residents of Florida. The determination of the cause and manner of their deaths proved more problematic. Numerous potential causes of death were explored. The only known medical information was that the male decedent suffered from a chronic neurological disorder. The forensic anthropology examination found no antemortem trauma or pre-existing natural disease processes that could have contributed to the deaths. Investigation of the residence revealed no evidence of carbon monoxide, suffocating gases or other toxic fumes, and there was no evidence of drugs or alcohol at the scene. Ultimately, their cause of death was identified by forensic toxicologic studies performed on specimens not commonly analyzed, including the dried residue found in a coffee cup at the scene and the desiccated material in the dog's food bowl.

Homicide/Suicide, Investigation, Cause of Death

D10 Case Study Ritualistic Homicide at Fort Lewis, Washington

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The goal of this presentation is to introduce the members of the forensic community to a unique murder scene where a multidisciplinary approach was used to show that this was a planned, methodical killing executed in a ritualistic style.

This presentation will impact the forensic community by examining this unusual case and discussing the impact that the crime scene processing, autopsy protocol, and laboratory work had in supporting the prosecution and conviction of the offender.

The goal of this presentation is to introduce the members of the forensic community to a unique murder scene where a multidisciplinary approach was used including crime scene analysis, medicolegal investigation, and multidisciplinary laboratory examinations were used to reconstruct the series of events surrounding this savage murder. Investigation demonstrated this was not a crime of passion as the defense suggested, but rather a planned and methodical killing executed in a ritualistic style.

In this case, on 12 July 2005, the body of the 19-year-old wife of an Army soldier was found posed on the kitchen floor of the husband's assigned U.S. Government quarters located at 2025 Bitar Avenue, Fort Lewis Washington amidst massive amounts of bloodstain patterns from the crime itself as well as actions of the subject and transfer stains from the family dog running through the scene. The examination of her body revealed numerous complex chop wounds inflicted with a meat cleaver, and the crime scene contained ritualistic aspects to include posing the body, insertion of a phallus device, and attempted decapitation.

The Special Agents of the U.S. Army Criminal Investigation Command (commonly referred to as CID) discovered during the course of the investigation that while her husband was deployed to Iraq, his wife allegedly became involved in an affair with another soldier. Upon her husband's return from deployment, he was taking part in group mental health counseling and was being treated for post traumatic stress disorder. The investigation further determined that the soldier idolized Richard Ramirez ("the Nightstalker") and frequently fantasized about killing and becoming a serial killer. Computer forensic analysis established that just hours prior to the murder, he had taken an online quiz entitled "Are you a serial killer?"

On the night of the murder, the victim went to the kitchen and began an online chat with her alleged lover. While she was seated near the kitchen island chatting on the computer, the soldier entered the kitchen, where he confronted her, struck her first with his fist, and then he retrieved a meat cleaver from a butcher block type knife holder. The subject then brutally attacked her with the meat cleaver striking her about the head and shoulders. Once she was immobilized, he stripped her, posed her, vaginally inserted a phallus, and wrote in her blood upon the refrigerator door "Satan said she deserved it." Further, he wrote a note which said "Til death do us part" and signed the note which he attached to her body.

Bloodstain pattern analysis of the scene was used to determine the facts surrounding the incident in question through the examination of the physical characteristics of stains; looking at the dispersion, the shape characteristics and morphology, the volume, the pattern, and the number of bloodstains and their relationship to the surrounding scene. Conclusions were based on evaluation of the stains and their relationship to one another and their relationship to the other physical evidence at the crime scene.

This presentation will examine not only the scene itself, but also the killer's behavior before, during, and after the murder as it relates to his state of mind and draw correlations to the ritual of a human sacrifice as defined in Anton LaVay's satanic bible, a book found in his possession when apprehended.

The husband took pictures of her body, packed his bags, and fled the area. He later became filled with remorse, and turned himself in. Forensic sciences, including bloodstain pattern analysis, latent print examination, questioned documents examination, and forensic pathology were used to determine the sequence of events surrounding the murder, ensuring his successful prosecution for which he received a life sentence.

Murder, Ritualistic, Multidisciplinary Approach

D11 State Sponsored Torture in Rome: A Forensic Inquiry and Medicolegal Analysis of the Crucifixion of Jesus Christ

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The goal of this presentation is to present to the members of the forensic community a forensic examination of the trauma involved in the crucifixion along with a medicolegal analysis of crucifixion focusing on the mechanisms and cause of death.

This presentation will impact the forensic community and/or humanity by describing the significance of the crucifixion process and how the physical effects of such a barbaric execution caused major medical distress in the human body.

The presentation will illustrate with medicolegal art and explanation the pathology, physiology, cardiology, anatomy, and forensic aspects of this event.

Crucifixion was a barbaric form of capital punishment practiced by the Romans, Persians, Phoenicians, Egyptians and others. The word crucifixion is derived from the word "*cruciare*" (to torture and torment). The Romans were well trained in every step of this technique. There were five soldiers assigned to each crucifixion. The team consisted of a centurion (*exactor mortis*), who was in charge of four soldiers called the *quaternio*.

This presentation is based on the research and text entitled, *The Crucifixion of Jesus: A Forensic Inquiry* by the eminent forensic pathologist and forensic scientist Dr. Frederick T. Zugibe, MD, PhD whose study touched on the entire range of scientific and medical background involved in various areas of forensic pathology and human anatomy as it relates to the crucifixion.

The presentation will start with events as they unfolded in the Garden of Gethsemane and introduce the audience to the term "hematidrosis" (The sweating of blood). This medical condition as defined in Stedman's Medical Dictionary is an excretion of blood or blood pigments in the sweat. Hematidrosis is associated with a severe anxiety reaction triggered by fear. Reportedly, Jesus was able to envision the entire gamut of suffering to come. This prelude produced the all of the medical criteria to initiate the sympathetic autonomic response as well as the severe counter parasympathetic response causing severe dilation and rupture of the blood vessels into the sweat glands.

The presentation will then focus on the scourging and the use of the flagrum in this barbaric method of torture prior to the crucifixion. The physical effects of the scourging on Jesus will be presented along with a discussion on hypovolemic shock.

Illustrations will be presented through medicolegal art the crowning of thorns and how these thorns caused Jesus to suffer trigeminal neuralgia one of the worst pains that humans can suffer.

Torture was the prelude to crucifixion. The nailing of both the hands and feet were the rule. Jesus, who was already weak from the hematidrosis and hypovolemic shock as well as the lancing pains from the crown of thorns, was forced to carry his own cross. This exhaustion was accompanied by shortness of breath, pleural fluid accumulating within His lungs with possible pneumothorax due to the scourging. The intense heat and weight of the cross piece caused Him to fall. The *exactor mortis* could not allow Jesus to die before crucifixion so Simon of Cyrene was designated to carry the patibulum for Jesus.

This presentation will be instructive and informative to the forensic community and will dispel some of the myths of the crucifixion as depicted in the media and popular movies. It will also present compelling evidence to support the actual cause and mechanism of death of Jesus Christ on the cross.

The impact of the presentation occurs when the audience understands the significance of the crucifixion process and how the physical effects of such a barbaric execution caused major medical distress in the human body. The medicolegal aspects of the crucifixion will be presented in lay terms augmented with specific illustrations to depict in exquisite detail the findings and determinations regarding the cause and mechanism of death.

Jesus was brought to the place of crucifixion and stripped of both His outer garment (a cloak) and His tunic beneath the coat. He was gasping for air as he clutched His chest with every breath...the result of the scourging. Every movement caused unbearable pain. Jesus was thrown to the ground and made to lie on his back with His shoulders and outstretched arms on the patibulum (cross piece). One of the executioners then laid across His chest and another across His legs to hold Him down so that a third cohort could nail His hands to the crosspiece. This caused excruciating pain in His chest and severe difficulty breathing causing him to scream out in agony.

A large spike like nail measuring about 4¾ was nailed through the palm of each hand just below the bulge at the base of the thumb and into the cross piece. The pains would have been brutal, like hot pokers traversing the arms causing Jesus to arch His torso. Two of the *quaternion* grabbed the ends of the crosspiece while a third member grasped Jesus around the waist, getting Him to his feet backing Him up to the upright. Two of the *quaternion* lifted the crosspiece while two others lifted Jesus by the legs and inserted the crosspiece into a mortise on the top of the upright. His knees were then bent until his feet were flush to the cross.

His feet were then nailed into the cross. Jesus would likely have cried out in agony as each foot was nailed. "They have pierced my hands and my feet, I can number all my bones." (Psalms 22:16-17)

Forensic Reconstruction

When one considers each phase of Jesus' suffering beginning at Gethsemane and ending at Calvary the forensic conclusion is that Jesus died of shock. Jesus had experienced hematomia prior to being viciously scourged and severely flogged, causing extensive damage to the lungs, ribs and body wall, thereby throwing Him into early shock manifested by extreme weakness, tremors, probable lung collapse, seizures and fainting. Add the mental anguish, the crowning of thorns, the carrying of the cross piece of the cross, and the crucifixion process and anyone with a background in forensic pathology or emergency medicine would wonder how Jesus lasted as long as He did.

There are various types of shock. Hypovolemic shock is shock marked by a significant fall in the blood volume due to hemorrhage or loss of body fluids. Traumatic shock (injury shock) results from a serious injury. The presence of pain alone from a traumatic event stimulates certain nervous mechanisms of the brain, resulting in a drop of blood pressure and a reduction of blood flow to the tissues. Jesus suffered severe blood and fluid losses as well as excruciating pain.

The scourging resulted in penetration of the skin with trauma to the nerves, muscles, rib fractures, dislocations, lacerations, infiltration of significant amounts of blood throughout the intercostal spaces and back and chest musculature, bruises, and alveolar rupture and possible collapse of a lung (pneumothorax). Over a short period of time, an inflammation of the sac of the heart termed pericarditis would have ensued manifested by stabbing pains in the chest.

The irritation of the trigeminal nerves of the scalp from the crown of thorns would have caused lancinating pains across the scalp and face. This would have added to the state of the traumatic shock from the scourging. The splinting of the chest wall and the causalgia from the nailing of the hands and feet also added to the traumatic shock.

As Jesus hung on the cross with the weight of His body pulling on the nails in the hands and feet there would have been episodes of agonizing pain every time He moved. These episodes and unrelenting pains in the

chest wall from the scourging would have worsened the state of traumatic and hypovolemic shock. Increasing pleural effusion, pulmonary edema and excessive sweating was induced by the trauma as well as heat of the sun. As Jesus arched his body to relieve the cramps in his legs and arms He would have had to press His head with the crown of thorns against the upright and this would have reactivated the trigeminal neuralgia, which caused further shock and pain.

The Cause of Jesus' Death

According to Dr. Zugibe's exhaustive study: *The Cause of Death: Cardiac and respiratory arrest, due to hypovolemic and traumatic shock, due to crucifixion.*

Crucifixion, Hematidrosis, Hypovolemic Shock

D12 Can a Scoring System Accurately Reflect Cadaver Decomposition?

Reyna Johnson, Department of Entomology, University of Nebraska-Lincoln, Lincoln, NE 68583-0816; Ashley Spicka, Biology Department, Nebraska Wesleyan University, 5000 St. Paul Avenue, Lincoln, NE 68504; and Jennifer Bushing, David O. Carter, PhD and Leon G. Higley, PhD, University of Nebraska, 202 Plant Industry Building, Lincoln, NE 68583*

After attending this presentation, the attendees will understand that several ecological variables influence cadaver decomposition, making it problematic to treat decomposition as a semi-continuous variable to accurately predict postmortem interval (PMI).

This presentation will impact the forensic science community by demonstrating the current challenges of using stages of decomposition to determine PMI and by proposing a system to determine PMI using key decomposition characteristics.

Estimating postmortem interval can be vitally important in a death investigation. Not only can PMI help determine the possible victims to identify the cadaver, but an accurate PMI can also assist in retaining or eliminating suspects. Using key physical characteristics of decomposition coupled with consideration of the ecological factors could help investigators estimate PMI more accurately. However, developing a reliable method to uniformly identify the current stage of decomposition becomes a challenge that the forensic community should be aware of and work together to overcome. To help achieve this, we tested a proposed point-based system in which a number is assigned based on the physical characteristics of the cadaver. This number, along with accumulated degree days (ADDs), has been reported to provide an accurate estimate of PMI.

The experimental site was located at the University of Nebraska Agricultural Research Development Center located approximately 48 km north of Lincoln, Nebraska, USA. The site is a pasture that is intermittently grazed by cattle and horses. The climate is temperate mid-continent characterized by hot summers, cold winters, and moderately strong surface winds. Average annual precipitation is 695 mm. Approximately 75 percent of the precipitation occurs between April and September. Mean annual temperature is 9.8 °C with mean minimum and maximum temperatures ranging from 0 °C (January) to 31 °C (July). The vegetation at site is dominated by non-native grass (smooth brougham) and forb (white clover) with some native vegetation, including daisy fleabane, yellowwood sorrel nut sedge, and pasture rose. Swine (*Sus scrofa*) carcasses of four contrasting masses approximating sizes from neonate to adult (~3 kg, ~20 kg, ~40 kg, and ~50 kg) were used. Swine were killed with blunt force trauma to the cranium, weighed, and placed on their right side on the soil surface facing west. Each day for two weeks, the remains were scored using the provided scale for three body regions: the head and neck, the trunk, and the limbs. Cadavers were photographed each day. At the end of the two weeks, cadaver decomposition was scored using the photographs. This experiment was replicated three times, which resulted in a total of twelve swine cadavers.

The scoring method failed to have uniformity between measurement in the field and measurement in the laboratory using photos of cadavers. A major flaw with the system is the lack of detail and number of stages of the decomposition process. Not only do the stages of decomposition vary with body region, but the stages of decomposition are not extensive enough to give the necessary detail to determine PMI. Thus, to improve the system, we suggest that five broad descriptions of decomposition (Fresh, Bloating, Active Decay, Advanced Decay, Remains) should be used, with additional detail and specificity of key characteristics of each stage and the progression of each stage. In particular, details of insect activity, patterns of tissue loss, and changes in cadaver anatomy, all coupled with environmental data (especially temperature) are necessary to develop more accurate tools for associating the status of decomposition with time.

Forensic Taphonomy, Decomposition, Postmortem Interval

D13 Cadaver Mass and Decomposition: How Long Does It Take for a Cadaver to Increase the Concentration of Ninhydrin-Reactive Nitrogen in Soil?

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After attending this presentation, attendees will understand the relationship between cadaver mass and the concentration of ninhydrin-reactive nitrogen (NRN) released into the soil during decomposition, as well as the time required for a significant ($P < 0.05$) increase in gravesoil NRN.

This presentation will impact the forensic community and/or humanity by showing that NRN can be used to detect gravesoil within one week of the onset of decomposition.

A significant amount of NRN is released into gravesoil during cadaver decomposition. However, the time required for this process to occur is currently unknown. Further, it is unknown if this release is related to initial cadaver mass. It was hypothesized that a correlation exists between cadaver mass and the time required for a significant increase in gravesoil NRN, which would assist in locating sites of cadaver breakdown. To do this, cadaver mass loss and the concentration of gravesoil NRN over a period of 21 days during the summer (June 2007) was measured.

The experimental site was located at the University of Nebraska Agricultural Research Development Center located approximately 48 km north of Lincoln, Nebraska, USA. The site is a pasture that is intermittently grazed by cattle and horses. The soil at the site is a deep silty clay loam of the Yutan series (Mollic Hapludalf). The climate is temperate mid-continental characterized by hot summers, cold winters, and moderately strong surface winds. Average annual precipitation is 695 mm. Approximately 75 percent of the precipitation occurs between April and September. Mean annual temperature is 9.8°C with mean minimum and maximum temperatures ranging from 0°C (January) to 31°C (July). The vegetation at site is dominated by non-native grass (smooth brougham) and forb (white clover) with some native vegetation, including daisy fleabane, yellowwood sorrel nut sedge, and pasture rose.

Swine (*Sus scrofa*) carcasses of four contrasting masses approximating sizes from neonate to adult (~3 kg, ~20 kg, ~40 kg, and ~50 kg) plus a control (no cadaver) were used. Swine were killed with blunt force trauma to the cranium, weighed, and placed on their right side on the soil surface facing west. Soil samples were collected (0-5 cm depth) from adjacent to the cadaver at intervals of 24 hours for the initial 14 days. This experiment was replicated three times, which resulted in a total of 12 swine cadavers.

The concentration of gravesoil NRN increased significantly within the first week of cadaver decomposition. This demonstrates that NRN can be used a presumptive test for gravesoil within seven days of death. Neither a simple correlation nor a simple correction factor between cadaver mass and NRN concentration developed. The smallest mass, the neonatal swine, decomposed much faster than the other the adult (50 kg) swine, probably because there was less tissue to be consumed by insects and microbes. The neonatal swine were dry within 10 days, whereas adult cadavers took up to 18 days to dry. Future research should focus on the persistence of NRN in gravesoil to determine the maximum amount of time gravesoil NRN is significantly greater than basal NRN.

Ninhydrin, Forensic Taphonomy, Decomposition

D14 Decomposition Patterns Associated With Cadavers of Contrasting Mass

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After attending this presentation, attendees will understand the fundamental patterns of cadaver mass loss during decomposition on the soil surface and a methodology used to analyze cadaver breakdown.

This presentation will impact the forensic community and/or humanity by demonstrating that neonate cadavers follow a pattern of mass loss different to adult cadavers.

The rate of decomposition has been estimated to be the same throughout different sizes of bodies. Ideally, every cadaver would have the same equation for determining the time of death, however, different body types and masses might offer different rates and patterns for decomposition. It was hypothesized that cadavers of contrasting mass will decompose at different rates and, thus, be associated with contrasting patterns of decomposition.

The experimental site was located at the University of Nebraska Agricultural Research Development Center located approximately 48 km north of Lincoln, Nebraska, USA. The site is a pasture that is intermittently grazed by cattle and horses. The climate is temperate mid-continental characterized by hot summers, cold winters, and moderately strong surface winds. Average annual precipitation is 695 mm. Approximately 75 percent of the precipitation occurs between April and September. Mean annual temperature is 9.8°C with mean minimum and maximum temperatures ranging from 0°C (January) to 31°C (July). The vegetation at site is dominated by non-native grass (smooth brougham) and forb (white clover) with some native vegetation, including daisy fleabane, yellowwood sorrel nut sedge, and pasture rose. Coyote (*Canis latrans*) and turkey vulture (*Cathartes aura*) are the primary scavengers in the area.

Swine (*Sus scrofa*) carcasses of four contrasting masses approximating sizes from neonate to adult (~1 kg, ~20 kg, ~40 kg, and ~50 kg) were used. Swine were killed with blunt force trauma to the cranium, weighed, and placed on their right side within a PVC frame on the soil surface facing west. PVC frames with polypropylene mesh were constructed for mass loss measurements. The use of PVC frame construction allowed free movement of decomposition fluids into the gravesoil. For two weeks, each cadaver was weighed every day. After two weeks the weight measurements were taken less frequently due to the stabilization of cadaver mass.

The smaller pigs lost their weight much faster than the larger pigs, but also showed a difference in pattern of mass loss. Generally, remaining mass of all pigs followed a sigmoidal curve with an extended tail (reflecting

the remains stage of decomposition). However, smaller pigs (1kg and 20kg) had both steeper slopes of maximum decomposition rate and different patterns of weight stabilization than did larger (40kg and 50kg) pigs. Thus, the hypothesis that decomposition rates and patterns of decomposition of the smaller and larger pigs were significantly ($P < 0.05$) different was accepted.

With this information, it is suggested that human cadavers of contrasting mass might also follow different rates and patterns of decomposition. In particular, babies and small children likely follow different rates and patterns of decomposition relative to adults. This phenomenon needs to be explicitly considered, particularly when the physical characteristics of a cadaver are used as the basis for estimating postmortem interval.

Forensic Taphonomy, Mass Loss, Postmortem Interval

D15 Controlled Prescription Drugs Commonly Associated With Pain Management: Evidence Analyzed by State and Local Crime Laboratories in the United States From 2004 to 2006

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After attending this presentation, attendees will have an enhanced understanding of prescription drug seizures of diverted pharmaceutical drugs associated with pain management including the geographical distribution of seizures in the United States over a three year period, 2004 through 2006.

This presentation will impact the forensic community and/or humanity by providing crucial information on the diversion of narcotic analgesic drugs.

After attending this presentation, attendees will have an enhanced understanding of prescription drug seizures of diverted pharmaceutical drugs associated with pain management. Analysis of the data will include the geographical distribution of seizures in the United States over a three year period, 2004 through 2006. The presentation will be based on data from the National Forensic Laboratory Information System (NFLIS) which reflects drugs seized by law enforcement agencies and analyzed by forensic laboratories, focusing specifically on controlled prescription drug analgesics commonly associated with pain management.

Chronic pain affects over 50 million Americans. The non-medical use of diverted controlled substance prescription drugs commonly used in pain management is a serious and growing problem in the United States. An estimated 168,476 narcotic analgesic items were analyzed during this period. The estimated number of prescriptions dispensed per drug item reported in NFLIS for 2004 through 2006 indicates that methadone, morphine, and oxycodone had low prescription-to-seizure ratios compared to other drugs, indicating a potentially higher level of diversion. Hydrocodone (65,161 items), oxycodone (50,668 items), and methadone (15,728 items) were the most commonly reported narcotic analgesic prescription drugs in participating state and local crime laboratories from 2003 to 2006, representing 78% of narcotic analgesics. In 2006, hydrocodone was the 5th most common drug reported in NFLIS followed by oxycodone (7th), methadone (11th), morphine (16th), codeine (21st), and fentanyl (25th). Highlighted findings will include regional findings which demonstrate that in the West, the most prevalent narcotic analgesic drug item identified was hydrocodone (37%). In the Northeast, Midwest

and South regions; oxycodone was identified as the most prevalent narcotic analgesic drug item at 49%, 33% and 25% item counts respectively. The number of items reported as fentanyl by NFLIS laboratories has dramatically increased in this time period (1,728 items in 2006) with the highest increases reported in the Northeast. The lowest fentanyl item count was found in the data report from laboratories in the West region. Additional data will show population adjusted regional trends and depict spatial distribution of selected analgesic drugs (e.g., hydrocodone, oxycodone, methadone, fentanyl) by using Geographic Information System (GIS) analysis.

Laboratories participating in NFLIS analyze and report on drug evidence secured in law enforcement operations, offering a unique resource for monitoring drug abuse and trafficking, including the diversion of legally manufactured drugs into illegal markets. NFLIS is an important analytical resource for drug policy and can provide timely information on the illicit trafficking of prescribed drugs across the United States.

Pharmaceutical Diversion, Prescription Drug Analysis, Drug Seizures

D16 Databasing the Disappeared and Deceased: The Use of Internet Resources in Resolving Missing and Unidentified Persons Cases

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After attending this presentation, attendees will have an awareness of the various resources available on the World Wide Web that may be helpful in resolving missing and unidentified person cases. This presentation will provide attendees with information on how to implement and maintain websites that deal with missing and unidentified person cases and offer suggestions on how the function and efficacy of existing websites can be improved.

This presentation will impact the forensic community and/or humanity by evaluating the effectiveness of web-based resources in resolving cases of missing and unidentified persons.

When an individual goes missing or an unidentified body is found, many resources, both public and private, are available to assist in resolving the case. Apart from the traditional means for drawing attention to cases such as flyers and media coverage, it has become common for information on missing and unidentified persons to be provided on the World Wide Web. An Internet search for "missing persons" or "unidentified dead" will result in a long list of websites that are operated and contributed to by a wide variety of entities including state, county and local law enforcement agencies, state clearinghouses and departments of public safety, coroners, medical examiners, odontologists/forensic dentists, forensic anthropologists, nonprofit organizations, volunteers, and concerned citizens among others. For law enforcement and the public alike, the sheer number of websites available can make it difficult to know where to start an Internet search regarding a missing person's whereabouts or unknown decedent's identity.

These resources differ greatly in the type and extent of information they offer online. Websites for missing and unidentified persons information may choose to provide any number of details about each case and often include photos, physical descriptions, dates of birth and/or death, facial reconstructions or age progressions, information or photos of victim's clothing, personal effects, jewelry, etc. The amount and quality of information provided span the spectrum, but websites that offer more detailed information may have greater success in resolving cases. Unfortunately, the benefits of such websites can be rendered less effective by design faults such as poor ease of navigation, or the employment of search functions that are not adequately broad. Inaccuracies and inconsistencies in the information posted can occur if there is no protocol

for entering and following up on information, or if the information posted is not verified against other sources. Despite the large number of websites devoted to this issue, few seem to coordinate with each other or even with other organizations within their own counties or states.

For the families and friends of missing persons, online searches can offer a new outlet for hope when they feel all other efforts have been exhausted. Websites that supply information on missing and unidentified persons can also aid law enforcement by broadcasting case information to a wider audience, raising public awareness of missing individuals and unknown decedents. Improving the usability and effectiveness of web-based searches and databases for missing and unidentified persons information may lead to swifter justice for victims and closure for both families and law enforcement agencies.

The raw data and statistics provided in this presentation have been collected from the following sources: (1) interviews with family members and friends of missing persons that are currently still missing, or were once missing but are now confirmed deceased, (2) surveys completed by coroners, medical examiners, forensic anthropologists, odontologists/forensic dentists, members of law enforcement, employees and volunteers of nonprofit organizations, state clearinghouses, departments of public safety and other professionals with experience in missing and unidentified persons cases, and (3) interviews with Webmasters and employees of websites that house information on missing and unidentified persons. This presentation will include a list of items that should be provided online that can be useful in solving such cases. Finally, it will indicate some of the most effective websites that assist in this effort.

Missing Person, Unidentified Person, Websites

D17 From Researcher to Practitioner: Bridging the Technology Gap

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The goals of this presentation are to: (1) describe instructional design process to effectively deliver technical research data to forensic practitioners, (2) discuss multimedia options available for distribution to a wider audience, and (3) describe a suitable evaluation process to optimize technical transition of research data to practitioners.

This presentation will impact the forensic community and/or humanity by providing a model to facilitate future technical transfer training at the National Forensic Science Technology Center and the National Institute of Justice which effectively bridges the gap between researcher and forensic practitioner.

The National Institute of Justice (NIJ) sponsored the National Forensic Science Technology Center (NFSTC) to facilitate the transfer from researcher to practitioner of six emerging technologies with forensic applications. The training sessions provided instruction and presentation of research data for Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS) for Forensic Toxicological analysis, Cedar Fox Questioned Document (QD) software for Handwriting analysis, Laser Microdissection in Forensic Biology applications, Clandestine Methamphetamine Analysis using Capillary Electrophoresis, and Polynomial Texture Mapping software for footwear and tire Impression examinations. The objective of each two day training session was to provide analysts with an overview of the theoretical and practical applications of the emerging technology. Laser Microdissection training was provided in two separate workshops with special focus for both analysts and laboratory managers.

The format for the workshop series was coordinated by a panel of NIJ staff, instructional designers, researchers, and laboratory staff. A primary

directive given from the NIJ was to reach out to as many practitioners as possible to ensure that operational examiners may be aware of current research and technologies. This is somewhat limited with a classroom format and so it was decided that the series would be modeled on a blended approach. A classroom format was employed for each workshop with 12 to 16 practitioners in attendance. Each workshop took place in a recording studio set up at the NFSTC and was captured and edited to allow media based delivery. The edited workshop was made available via internet download together with instructional materials (curriculum, PowerPoint® lectures, and reading materials) for each workshop. This effectively allowed delivery free of charge to all interested parties.

Twelve to sixteen forensic examiners attended each workshop. Attendees were chosen by NIJ based on knowledge of intent to imminently incorporate the technology at hand into their laboratory protocols. While the primary objective was to make the information available as soon as possible, current instructional design principles were applied to the curriculum content. Instructional designers worked with each researcher to produce a detailed curriculum with corresponding objectives, reading material, and practical exercises. Each training workshop included theoretical lectures, demonstrations, practical exercises, and data interpretation exercises as applicable. Both classroom and laboratory activities were media captured. Training evaluation surveys were conducted at the conclusion of each training session, as well as three months after the training. The surveys were designed to assess the overall effectiveness of the training, the progress of individual laboratories in implementing the technology, and the impact of the workshop on laboratory implementation of the technology in question.

Initial evaluation responses obtained at the conclusion of each workshop indicated that attendees found it useful to learn of emerging technologies with potential for implementation in operational forensic laboratories. The majority of attendees indicated an interest in implementation, though with some modifications.

It is anticipated that this format will be used as a model to facilitate future technical transfer training at the National Forensic Science Technology Center and the National Institute of Justice. Experience has shown that this blended training format effectively bridges the gap between researcher and forensic practitioner.

Research, Training, Technology

D18 USB Portable Operating System and File System Circumvention Capability Analysis

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After attending this presentation, attendees will be familiarized with the functionality of portable operating systems and programs used on USB flash devices, as well as their file system circumvention capabilities.

This presentation will impact the forensic community and/or humanity by identifying residual data specific for USB portable operating systems.

The emergence and availability of personal computer technology has resulted in a broad spectrum of uses, ranging from the recreational to the criminal. Everyday computer use inherently leaves traces of residual data available for forensic analysis and identification. With the advent of solid-state data storage devices (e.g. USB flash media, memory cards), programs and/or operating systems can be made portable while essentially circumventing normal operating system artifacts. These removable storage mediums are becoming increasingly large in memory and small in size while their prices drop.

Even though a USB apparatus may be small and easily removed from a computer, it is not gone without a trace. Plugging in a thumb drive creates several identifiers in the registry, which can be used to help identify a particular device. The registry is made up of a series of files that is utilized by Microsoft Windows to store various computer configurations. There is

a lot of information that a digital investigator can ascertain such as: typed URLs, run command history, and user accounts. Once individual keys in the registry are identified, their last write times can be used to create a timeline of events.

Four programs/portable operating systems were used in this study to determine their operability and circumvention success; Flash-Puppy (portable version of linux), U3 (dual partition file system with start menu), MojoPac (virtual Windows XP), and Portable Apps (single partition file system with start menu). These were chosen to show a little variety in the route taken to achieve the company's stated goals while still using a removable storage device.

In order to ensure that only the changes to the host operating system were analyzed, an image of a basic installation of Windows XP was put onto a 40 GB, zero-wiped hard drive for each experiment. An initial image of the hard drive disk (HDD) was taken using EnCase. Then, the HDD was put into a computer, booted up, and the USB device was plugged in. Basic flash drive programs (such as Mozilla Firefox Portable, Open Office, Skype, and Trillian) were accessed and files were created and saved to the flash drive before ejecting the USB drive and shutting down the computer. After the experiment, the HDD was re-imaged to look for changes to the system. Of the four programs tested, Flash-Puppy returned the best results for someone who didn't want their tracks traced, followed by MojoPac, U3, and Portable Apps.

As removable storage media continues to increase in popularity and become more widely available, people begin to fear that any personal data which is stored on these devices may be intercepted or left behind after their use. In response, companies and developers have created programs which claim to make it appear as if you were never there. However, when a flash drive is plugged into a USB 2.0 Port, its unique information is imprinted onto the registry in many places.

Digital Forensics, File System Circumvention, USB Flash Drive

D19 Technical Overview and Application of 3-D Laser Scanning for Shooting Reconstruction and Crime Scene Investigations

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After attending this presentation, the attendees will gain an understanding of the principles, operation, and capabilities of 3D laser scanning as it applies to crime scene investigations.

This presentation will impact the forensic science community and/or humanity by describing the operation, application, and capabilities of 3D laser scanning as a forensic tool.

3D laser scanning for documenting crime scenes is a growing use for a measurement technology that has already gained wide acceptance with surveyors, engineers and construction professionals. 3D laser scanning involves deploying an advanced type of survey/measurement instrument that is used to remotely measure and document crime scenes with extraordinary accuracy, completeness and speed. It is already being used by police agencies in the United States and Europe and can also be used for crash investigations, fire scene reconstruction, failure analysis, vulnerability and threat assessment as well as modeling simulation and analysis of environments.

The benefits of 3D laser scanning for any type of investigation are:

- Scenes can be recorded exactly as the first responder found it without altering evidence
- Exact body positions and evidence can be captured in great detail to an accuracy of 6mm at a distance of 50 meters
- Scanning is an objective scene recording tool which minimizes the chance of overlooking key evidence due to human error

- Measurements can be made between any objects in the scene long after the scene has been released
- The scene can be viewed in 3D from any viewpoint
- The data collected can be used to create compelling 3D jury exhibits

This presentation will describe the operation, application and capabilities of this new forensic tool. Additionally, the accuracy, precision and validity of the technique will be examined by comparing data generated with standard crime scene measurement techniques to those collected with a Leica Geosystems ScanStation 3D laser scanner. Actual crime scenes that have been scanned will be presented as they were documented to demonstrate the advanced capabilities of 3D laser scanning in the areas of captured detail, completeness, and 3D visualization. A visually compelling and accurate 3D method of depicting trajectories will be presented. Data from 3D laser scanning will be compared to trajectory measurements taken using standard methods for comparison in the areas of accuracy and precision. This will be accomplished by firing known impact angle shots through various materials and comparing the measurements using standard methods and tools like protractors, plumb bobs, inclinometers and photographs to those computed from scanned data. The data collected from both the scanning technique and manual methods for this controlled experiment shall be tabulated and compared in order to show the accuracy and validity of this technique. As more and more animations and exhibits generated from 3D laser scanning make their way into courtrooms it is becoming apparent that a generation of jurors raised on 3D video games shall have greater expectations for the kind of exhibits placed before them.

The audience will gain an understanding that 3D laser scanning is a forensic tool that is with us to stay, and that it will only be a matter of time before it becomes the norm for crime scene investigation. At the conclusion of this presentation the audience will have a basic understanding of the principles, operation and capabilities of 3D laser scanning as it applies to crime scene investigation.

3D Laser Scanning, Crime Scene Investigation, Trajectory

D20 Criteria for Identification of Gunshot Events From Video Imagery: A Case Study

Philip N. Williams, BS, Federal Bureau of Investigation, Federal Bureau of Investigation Laboratory, Counterterrorism and Forensic Science Research Unit, Building 12, Quantico, VA 22135*

After attending this presentation, attendees will gain an understanding of the challenges, possible solutions, and minimum useful criteria for identification of possible gunshot events using crime scene surveillance video.

This presentation will impact the forensic community and/or humanity by establishing a common framework against which the criminal court system can evaluate the validity and admissibility of expert witness testimony concerning gunshot event determinations from video evidence alone.

With the prevalence of video surveillance systems in the United States, the chances of capturing criminal and police shooting incidents on video has increased significantly. One of the pertinent questions frequently raised during the investigation of these incidents is the actual number of shots fired. In many cases the usefulness of the video images in determining this critical issue is either overlooked or presumed to be of little value. One of the principal reasons for this relates to the difficulty of positively identifying probable gunshot events using the video images in isolation from other evidence, and the lack of validated criteria for establishing the occurrence of such events from video alone.

An approach to gunshot determinations from video will be presented that will set forth a series of criteria for determining which events evident in the imagery could or should be used in these determinations. In addition

to simple observation of isolated events, courts will also demand for admissibility purposes, some form of objective cumulative threshold criteria before a reasonable conclusion that a gunshot event has occurred can be reached. It is these criteria and methods for quantification of the results of the analysis that are critical in admissibility related hearings.

An actual forensic case study for this analysis, that was adjudicated in California will be presented.¹ In this case, analysis showed that a series of isolated events could be demonstrated to actually be connected within the context of proper temporal and spatial analysis, which lead to more or less decisive conclusions for each event as to their nature as gunshot events. In some cases, a series of isolated events, while still connected temporally, may be insufficient to reach a decisive conclusion, based on the nature and/or number of events and those issues will also be addressed. This analysis was used by prosecutors in support of firearms reports, and crime scene analysis, which combined, largely refuted the Defense contention that the accused had fired warning shots prior to shooting his intended victims.

The analysis will also show that it is possible to identify events shown in the imagery as falling into one of three categories. Category one, is events which meet the full range of criteria as to number, type, space and timing, and therefore may be reasonably classified as gunshot events. Category two, is events which meet certain criteria, such as a number of isolated events, temporal connection, or type, but are of insufficient number, type, or timing such that it is not possible to exclude event types other than gunshots. Category three events are isolated events that meet only one of the threshold number, type, or timing, criteria to be reasonable considered as having been the result of a gunshot, but are still consistent with an action sufficiently anomalous to draw attention for additional analysis.

It is anticipated that through the publication of this analysis a proper foundation may established sufficient to support broader acceptance by the Courts for video based gunshot evidence, and reduce evidentiary challenges for this type of evidence in the future.

Reference:

¹ The People of the State of California, Plaintiff, -Versus- Stuart Alexander, Defendant, Docket NO. 139527.

Gunshot, Video, Forensic Video Analysis

D21 The Boyd Case: Shooting Incident Reconstruction

Alexander Jason, BA, ANITE Group, PO Box 375, Pinole, CA 94564*

After attending this presentation, participants will gain an understanding of the methods and technology utilized to analyze a shooting incident.

This presentation will impact the forensic science community by demonstrating a comprehensive approach to shooting incident analysis and reconstruction utilizing 3D computer modeling, photographic analysis, bullet trajectory determination, and bloodspatter pattern interpretation.

The case presented in this paper resulted in a complex shooting incident reconstruction in which wound paths, shooting locations, bullet trajectories, fired casing locations, bloodspatter, and dynamic positioning of a body were all significant elements.

An attempted armed robbery and kidnapping resulted in a police pursuit of a vehicle. The suspect fired at the police car behind him during a six minute pursuit in heavily populated urban area. When the suspect finally stopped his vehicle in a narrow street, his vehicle was struck by several bullets fired by police officers. The suspect got out of his car without the handgun and variously held his hands up in a surrender position and then down to his side. He went back and forth into and out of the vehicle. At one point, he sat on the driver's side floorboard, reached under the seat and turned rapidly towards police officers nearby.

Believing the suspect was now armed and about to shoot, one officer fired three rounds in rapid succession. The suspect was struck by two of these bullets and was wounded fatally. When police officers tried to move the body away from the car, the decedent's legs separated from his torso: he had no legs below his knees and was wearing two prostheses.

Several of the witnesses reported that the decedent was shot while his hands were in the up, surrender position. Although the shooting was determined to be legally justifiable, a wrongful death/excessive force civil action was filed against the officers involved and their department.

A shooting incident analysis and reconstruction was performed to address the key issues in this incident:

1. The location, position, and orientation of the decedent when shot.
2. The position of the decedent's hands when shot.
3. Sequence of shots.
4. The location of the vehicle.
5. Distance from shooter to decedent
6. Dynamic wound paths
7. Bullet trajectory angles
8. What certain witnesses could and could not have seen from their observation points.
9. Speed of vehicle during pursuit

As part of the analytical process, a three-dimensional computer based model was created which contained the street and sidewalk surfaces, model objects representing the parked cars near the shooting scene, buildings, trees, and street markings. This digital 3D model was created from actual measurements of the scene along with numerous photographs documenting all physical features including colors. The digital model was useful both for analysis of the distances between objects and locations and as forensic trial exhibits which allowed witnesses to illustrate aspects of their testimony concerning observed movements and locations.

The decedent received three bullet wounds; however one wound – in the left hand – was determined at autopsy to be consistent with a re-entry wound. An examination of the decedent's vehicle revealed the presence of bloodspatter in a distribution and location consistent with the left hand being aligned with a perforating bullet wound in the decedent's left thigh.

This paper demonstrates a comprehensive approach to shooting incident analysis and reconstruction utilizing 3D computer modeling, photographic analysis, bullet trajectory determination, and bloodspatter pattern interpretation.

Shooting Reconstruction, Video Analysis, Audio Analysis

D22 Advancing the Process of Post Blast Investigation

Thomas G. Gersbeck, MFS, 127 Knight's Ridge Way, Mays Landing, NJ 08330*

After attending this presentation, attendees will recognize the value of applying laser-scanning technology to post blast investigations.

This presentation will impact the forensic community as well as the military and public safety bomb disposal communities by demonstrating a timely, highly accurate, and tactically safe means of documenting crime scenes; specifically the scene of a large explosion.

One of the most complex investigations is that of a large post blast scene. The actions of investigators on a Combat Zone (CZ) post blast scene are very different from those currently conducted within the United States. An investigation in a CZ, such as Iraq, is made more complex by insurgent activities and secondary devices that limit scene documentation and evidence collection to about 30 minutes, greatly compressing normal investigative timelines. An investigation within the United States, where insurgent activity is not a factor and secondary devices are rare, allow investigators an appropriate amount of time to process the scene. Once secured, investigators will photograph the scene, measure the shape and depth of the crater, plot the location with GPS, obtain soil samples, and locate anything that may have come from the device; such as, Radio

Control (RC) components, command wires, switches, power sources, wires, fragmentation from ordnance or improvised sources. All of the evidence is photographed, documented, collected, and additional photographs are taken of any unique damage observed at the scene. Any evidence overlooked during this hasty process may be lost forever unless it was captured in a photograph. Consequently, the ability to photographically document a scene during this hasty process cannot be understated and any evidence not collected or photographed is forever lost.

In 2000, Total Station Mapping equipment was used for the first time on a Vehicle Bomb Improvised Explosive Device (VBIED) during a Federal Bureau of Investigation (FBI) VBIED School and quickly became the standard for processing these incidents. However, by the year 2000 the Total Station had been employed by accident investigators for approximately 12 years. Today, Laser-scanning technology is slowly replacing total station for accident reconstruction, but it has not been employed on a post blast scene in a CZ, nor can the author not find any examples of it being employed on a post blast scene in the United States.

The use of terrestrial 3D Laser-scanning for forensic mapping has created a paradigm-shift in the way investigators can collect and later analyze data after an incident. Using high-speed laser scanners, investigators can digitize the post-blast environment quickly and easily by making millions of highly accurate measurements. The scanner captures a "point cloud" which can be viewed in 3D from any perspective and provides a compelling visual archive of the scene. Laser-scanning is a remote sensing technology that minimizes the amount of time investigators are on scene thereby decreasing their exposure to possible hazards. Two field tests will be used to demonstrate the application of this technique. The first test involves an FBI VBIED course that will show the applicability of this technique to this type of investigation. The second test involves an FBI Combat Zone Post Blast Course utilizing a VBIED, and will reinforce the applicability of this technique and demonstrate the speed in which 3D Laser-scanning equipment can be employed -as the on-scene portion of this test will be under 30 minutes.

Manual measurement methods employed at a CZ scene may result in 20 to 40 measurements being obtained. Employing Total Station Mapping equipment would be a significant technological jump and data capture may increase to 400 or 500 points, but the time on scene is significantly increased. However, by employing the appropriate 3D Laser-scanning equipment an investigator can capture up to four million points in less than 30 minutes, greatly increasing the possibility of capturing information that may be overlooked.

Post Blast, Laser-Scanning, Point Cloud

D23 To Sort a Fly: A Simple Apparatus Built From Ordinary Materials, Using Ice as a Coolant for Sorting Live Blow Fly Specimens

Neal H. Haskell, PhD, 425 Kannal Avenue, Rensselaer, IN 47978*

After attending this presentation, attendees will learn an efficient, easy and inexpensive way to sort hundreds of gravid female flies from wild collected multiple species assemblages from over carrion.

This presentation will impact the forensic science community by creating greater precision in time of death (postmortem interval) estimations by using the presented entomological sorting technique.

Forensic entomology researchers are revisiting and re-evaluating growth and developmental data from previous growth studies due to differences of preferred methodologies in analytical approaches to case evaluations. The multiple protocols used in the earlier growth studies have led to discrepancies in the understanding of what is actually being reported in these studies. For example, there have been discussions of differences between a study conducted by Kamal in the 1950 and another by Greenberg from the 1990s for the development tables of calliphorid (blow flies)

species. These two studies cannot truly be compared with respect to the length of time between stadia (an insect stage duration) due to the fact that one study (Greenberg) assess the minimum time of development and the other (Kamal) looks at the mode duration. This is apples and oranges. However, some in the forensic entomology community are attempting to re-evaluate the development of the most common species of blow flies found in the forensic case records. To accomplish this, rearing protocols developed by Wells appears to be a sound and reliable methodology for this re-evaluation, but requires hundreds, if not thousands of eggs all being deposited within one to no more than two hours. Anesthetizing several hundred wild collected blow flies of multiple sex and species and then sorting only females of a single species is very difficult and requires expensive equipment (a cooling table). An inexpensive method is proposed here using houseware cake pans, an ice crusher (blender), a freezer, and a refrigerator. An inexpensive apparatus can be constructed from a few items in the houseware area at any department store. A rectangular cake pan, which is approximately 12"X22" with a plastic lid, will provide the base portion of the unit (Unit A). Use a square aluminum or steel cake pan (Unit B) for the inside element which has smaller dimensions (e.g. 9" X 9") and will fit into the larger rectangular cake pan (Unit A) with an inch or two of space around each side. Also, Unit A should have a greater depth than Unit B for space under the smaller unit. Cut a hole in the plastic lid of Unit A which Unit B will fit through (try to keep it a snug fit). Your coolant will be a mixed slurry of finely chopped ice (use an ice crusher rated blender) and water. Pour enough water into the ice so that it is slushy and will fill in the bottom and sides surrounding Unit B. This maintains a temperature which keeps the flies inert in Unit B. Unit B is your sorting tray and will be surrounded on the bottom, and all four sides with icy water. If buoyancy is a problem, Unit B can be weighted down with weights or two large rubber bands can be placed around Unit A and Unit B to hold the sorting pan down into the icy water. Pre-cool Unit B in the freezer for several minutes before placing into the ice bath. You will need additional temporary storage containers for the sorted specimens. A "small" "Mosquito Breeder" (BioQuip) with the collecting cone inverted into the base makes for quick placement of the specimens and the inverted cone prevents them from escaping back out once they regain flight. When testing the flies from your geographic area, you may find that the slushy ice water bath is not cold enough; you can add salt to lower the temperature of the ice/water mixture. If it works for ice cream, it will work for the flies, too.

The procedure will enable easy procurement of hundreds of gravid female blow flies of a selected species for obtaining thousands of eggs. These eggs can then be reared to different life stages for evaluating growth and development durations of any blow fly species. These data will then be used for greater precision in time of death (postmortem interval) estimations.

Forensic Entomology, Blow Flies, Sorting

D24 Paradigm Shift: Analog Film to Digital Media at the U.S. Army Criminal Investigation Laboratory

Carl R. Kriigel, BS, United States Army Criminal Investigation Laboratory, 4930 North 31st Street, Forest Park, GA 30297*

Upon the completion of this presentation, attendees will learn about the challenges and benefits of the journey to move from analog film based media to digital media and technology.

This presentation will impact the forensic community and/or humanity by sharing the various processes and decisions used to change the standard of using analog film and processing digital media by the United States Army Criminal Investigation Laboratory.

Many world events contributed to this paradigm shift. These included the fall of the Berlin Wall, U.S. Military reduction of troop strength and discontinued film development capabilities.

These challenged the U.S. Army Criminal Investigation Laboratory (USACIL) to explore new approaches to photography, film and video enhancement. As a result changes in technology enabled USACIL to develop more effective and efficient techniques for accomplishing a worldwide mission.

The USACIL underwent several phases when implementing digital technology. Some of the phases required considerable study and effort. Implementation of digital technology also met with resistance to change. These issues of change when moving to digital technology and some of the lessons learned will be covered.

Digital, Digital Technology, Film

D25 The Virtopsy Approach: Bridging Radiologic and Forensic Sciences

Michael Thali, MD, University of Berne, Institute of Forensic Medicine, Buehlstrasse 20, Berne, 3012, SWITZERLAND*

After attending this presentation, attendees will be aware of the newest developments in forensic imaging.

This presentation will impact the forensic science community and/or humanity by providing an overview and outlook of upcoming imaging technologies.

Forensic science has experienced revolutionary changes in different fields, such as genetics, crime scene investigation methods and toxicology. Forensic pathology, by contrast, still utilises the time-old, evidence-based methods introduced centuries ago, namely the dissection of a corpse and an oral description and written documentation of the findings obtained; this has been augmented in the past decades by photography. Although conventional X-rays have found their way into daily forensic practice, newer, clinically established methods, such as CT and MRI, seem to lag behind in their forensic implementation.

This conservative attitude towards new technologies is surprising in a field in which prosecutors and defence lawyers are, depending on the case circumstances, often eager to test novel methods. Regardless of these obstacles, many different institutions have implemented CT in postmortem forensic investigations.

In Switzerland, this revolution in forensic science started off in the mid-nineties, when the Institute of Forensic Medicine of the University of Bern started a project with the Scientific Service of the City Police of Zuerich. The aim was to document body and object surfaces in a three-dimensional fashion. A few years later, the Institute of Forensic Medicine again started a joint research project, this time with the Institutes of Diagnostic Radiology and Neuroradiology of the University of Bern. This project had the ambitious aim of detecting forensic findings of corpses using MSCT and MRI, and of comparing these results with autopsy findings.

This was the beginning of the Virtopsy® project. Later on, further methods and tools were added in addition to MSCT and MRI, so that now the project implements an ever expanding variety of imaging methods. The transdisciplinary research project Virtopsy® is dedicated to implementing modern imaging techniques into forensic medicine and pathology in order to augment current examination techniques or even to offer alternative methods.

The project relies on three pillars: 3D surface scanning for the documentation of body surfaces, and both multislice computed tomography (MSCT) and magnetic resonance imaging (MRI) to visualise the internal body.

3D surface scanning has delivered remarkable results in the past in the 3D documentation of patterned injuries and of objects of forensic interest as well as whole crime scenes. Imaging of the interior of corpses is performed using MSCT and/or magnetic resonance imaging (MRI). MRI, in addition, is also well suited to examine surviving victims of assault, especially choking, and helps visualise internal injuries not seen at external

examination of the victim. Apart from the accuracy and three-dimensionality that conventional documentations lack, these techniques allow for the re-examination of the corpse and the crime scene even decades later, after burial of the corpse and liberation of the crime scene. Virtual, non-invasive or minimally invasive approach will improve forensic medicine in the near future.

The Virtopsy approach is now used worldwide: The Office of the Armed Forces Medical Examiner (Armed Forces Institute of Pathology, Washington, DC, Dover, DE), which performs CT scans on military personnel killed in combat on a routine basis evaluated the usefulness of CT in the assessment of high velocity gunshot victims with promising results. Groups from the universities of Copenhagen (Denmark) and Linköping (Sweden) have started CT scanning on corpses on a broad scale, here again with promising results. According to personal communication, every corpse delivered to the Victorian Institute of Pathology (Sydney, Australia) undergoes a CT scan prior to autopsy. Also dedicated to this novel approach, the Society for Autopsy Imaging in Japan was founded in 2003. CT scanning has also been introduced into forensic anthropology. A French group (Toulouse) actually obtained superior results when assessing the case a charred body with respect to anthropological aspects than with traditional methods.

In conclusion, the non-invasive or minimally invasive approach envisioned by postmortem surface scanning and MSCT as well as MRI has several advantages to current forensic examination techniques, namely:

- Precise, objective and clear documentation of forensic findings for the court
- Calibrated, 3D documentation of findings
- Quality assurance through digital data archivation and transfer
- Reduction of psychological trauma for the next-of-kin
- Improved judicature in cultures with low autopsy acceptance

In the talk the newest developments of the Virtopsy project will be presented.

Forensic Imaging, Virtopsy, Forensic Radiology

D26 Novel Method for 3-D Biometric Face/Head Total and Partial Comparison Through Scanner-Invariant Slicing

Leonid I. Rudin, PhD, Jose- Luis Lisani, and Jean-Michel Morel, Cognitech, Inc., 225 South Lake Avenue, Suite 601, Pasadena, CA 91101*

The goal of this presentation is to present new theory and algorithm for 3D based face/head comparison.

This presentation will impact the forensic science community and/or humanity by extending the understanding of the state of the art 3D based techniques for biometric identification and comparison.

The classical techniques to compare 3-D surface-shapes are either exploit numerical, e.g., least-square, matching of surface shapes¹, or the 3-D data is matched through registration of “landmarks,” which are “meaningful loci that can be unambiguously defined and repeatedly located with a high degree of accuracy and precision.”² These methods may be classified as a “local” 3-D registration techniques, since they are based on point-to-point comparison cumulative metrics. Most recently a new class of ‘global’ 3D shape comparison methods was pioneered in³, which is based on comparison of coordinate-system invariant geodesic curves that connect pairs of surface points. The main advantage of this method is that under surface deformations which are area-preserving, the minimal length geodesics do not change. Thus it opens up a possibility to ‘expression-invariant’ face matching, as long as there is no shortening or stretching of the facial surface (as in opening and closing the mouth).

Neither of the above techniques is invariant with respect to the corresponding 3-D scanning method and machine which is used in collecting the 3-D data. It is well known that the scanning apparatus is

capable of introducing 3-D shape variations that are at least affine in nature. For example surface areas can get stretched and skewed. Therefore it is desirable to have a method that does not depend on the chosen 'extrinsic' coordinate system and is at least affine-invariant. Similarly, there is a need for a 'partial' comparison method that is able to identify matching shape parts, even if the rest of the shape is missing or distorted.

In this presentation, the theory for and demonstrate implementation of the new method for the matching and partial comparison of 3-D biometric Face/Head scanned data is proposed. The main idea is to "dissect" the 3-D shape of Face/Head 3-D scan into "invariant" slices. If such coordinates invariant slicing can be performed, the resulting "slice-curves" turn out to be also invariant, i.e., independent from affine transformations due to the scanner, and are independent of the selected coordinate system, which may vary for each scan, and each scanner. Then using affine-invariant methods of curve comparison, a matching criterion can be established for a whole or a part of the 3-D shape. The original affine-invariant 3-D surface-shape registration method was proposed by authors in^{4,5} It is based on a fundamental principle that geometric tangency is preserved by affine transformations, e.g., by zooming and skewing. Once the slicing curves are determined, the tangency condition can be used again on the 2-D "sub-manifolds" of curves. This results in parsing the 'slicing' curves into affine-invariant line-elements, which then can be coded and compared.

The traditional 3-D face matching methods will fail when very little 3-D complexity is present in the shape. Initially, the computational performance and stability of our method on the 3-D scanned database of "doll-heads" with affine variation of scanning parameters will be demonstrated. The significance of the doll-head bench mark data is that the examined shapes have very few significant 3-D features and no macro-textural information, unlike human faces which sometimes are easier to distinguish just by correlating local shape information. Several comparison examples with human Face/Head 3-D scans are also presented.

Furthermore, the 3D data are exploited to numerical matching of two surface shapes. The difference of two shapes are also visualized.

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3D Shapes, Shape Comparison, Scanner Invariant Slicing

D27 Remote Detection of Clandestine Mass Graves Using Field Spectroradiometer and Airborne Hyperspectral Data

Margaret Kalacska, PhD, and Lynne S. Bell, PhD, Department of Criminology, Simon Fraser University, 8888 University Drive, Burnaby, BC V5A 1S6, CANADA*

After attending this presentation, the attendees will gain an understanding of the fundamental concepts of remote sensing technology, and more specifically of hyperspectral data as it can be applied to forensic investigations such as the detection of clandestine graves.

This presentation will impact the forensic science community and/or humanity by demonstrating the utility of hyperspectral data with pattern

recognition techniques to locate a mass grave by means of differentiating its spectral reflectance from the background in a tropical environment, going beyond simply locating "disturbance".

Remote sensing, in the form of field spectroradiometry and airborne and satellite imagery has been relatively untested as an investigative tool in the location of mass graves. This form of remote sensing examines the reflected solar electromagnetic energy from the Earth's surface with specialized sensors on the ground (i.e., field spectrometer), in the air (i.e., airborne imagery) or in space (i.e., satellite imagery). The unique manner in which different targets reflect the electromagnetic radiation over a series of wavelengths is referred to as a spectral signature. In this study, the focus is on examining the spectral signature of an experimental animal proxy mass grave from field and airborne hyperspectral data in a tropical moist forest environment. With over one hundred bands (narrow wavelength regions) recorded in the visible to the shortwave infrared wavelengths (i.e., 400-2,500nm) specific features in the reflectance data that may be characteristic of the spectral response of the grave in comparison to a variety of soil/ground disturbances from field data or land covers such as pasture, forest, etc. from airborne imagery can be examined. The spectral response of the grave and a variety of soil/ground disturbances over a period of sixteen months from field spectra with a combination of standard machine learning techniques was examined. The airborne imagery, collected one month following experimental set-up was examined in n -dimensional space to isolate the spectral response of the grave. A clear separability between the spectra of the grave and the disturbed soils/ground throughout the sixteen month period was found. Distinct characteristics in the spectral response of the grave versus other targets in the landscape from the airborne imagery were also found. In addition, other observations show that vegetation regeneration was severely inhibited on the grave in comparison to disturbed soils. At the sixteen month period when the regeneration was sufficient to collect leaf samples, we examined in detail leaf-level spectra from grass growing on and off the grave with the same analysis techniques; the spectra were separable with minimal error and may be explained by differences in the chemical characteristics of the soil.

Remote Sensing, Cadaveric Decomposition, Spectrometry

D28 The Future of Professionalism in Digital Forensics

Carrie M. Whitcomb, MSFS, University of Central Florida, National Center for Forensic Science, PO Box 162367, Orlando, FL 32816-2367*

The goal of this presentation is to give the historical development of professionalism, explain where the profession is now, and explain where we need to be.

This presentation will impact the forensic science community by describing the professional organizations for digital forensic practitioners and individual certification are two cornerstones of professionalism.

When new types of tasks come into the work place and require technical skills, rapid growth groups of individuals with the appropriate talents focus on acquiring positions to do these specialized tasks can be seen. As the technology grows, the general population's need for the technology grows, and specialties within the technology begin to develop. People begin to focus their tasks in the given specialty and experts begin to develop. As experts develop they begin to be very independent. As time goes forward, they will make a mistake that draws attention from the community. At this point the community can decide to control these experts by investigations and litigations or the experts themselves decide to become self-regulating.

Today we are at the leading edge of self-regulating in the digital forensic areas through professional organizations, laboratory accreditation and developing professional certification boards for the various subspecialties in digital evidence.

In the future, the community will come together through these paths and will become very organized. So much so that they will develop forensic processes before the latest gadget is sold. At last we keep pace with the criminals!

Digital Forensics, Professionalism, Certification

D29 Application of Forensic Techniques to Data Preservation

John Tebbutt, and Douglas White, MS, National Institute of Standards and Technology, 100 Bureau Drive Stop 8970, Gaithersburg, MD 20899-8970*

The goal of this presentation is to learn about an automated procedure for processing large numbers of files to extract forensic metadata and how this procedure is employed for two disparate purposes: to provide court admissible computer file identification information to law enforcement agencies for use in forensic examinations of computer systems; and to aid in data reduction, management and cataloging of a large document corpus.

This presentation will impact the forensic science community by describing a set of procedures used both for the production of data for use by computer forensics investigators and the automation of data reduction and management in a large data collection.

Attendees will learn how the National Software Reference Library processes large numbers of files to extract forensic metadata and how this same process can be applied to aid in data reduction, management and cataloging of any large corpus of files. Application to the collection managed by the National Archives and Records Administration is given as a specific example.

This talk will demonstrate that procedures originally developed for the production of forensic metadata can be successfully applied in the automation of data reduction and management in a large data collection.

The National Software Reference Library (NSRL) of the National Institute of Standards and Technology (NIST) is studying the application of techniques initially developed to aid computer forensics examiners in the investigation of mass storage devices to assist the National Archives and Records Administration (NARA) in its mission to preserve the records of government until the end of the Union.

With the increasing use of information technology, successive administrations are producing correspondingly more data to be archived. For example, the archives has estimated that the amount of data from the George W. Bush administration to [date] is on the order of [X] TB. The automation of data preservation, management and cataloging becomes ever more vital to the NARA's mission.

The NSRL routinely collects and generates metadata associated with large numbers of files. The process by which file metadata are derived is largely application agnostic and can be applied to any large corpus of digital files. As with any sufficiently comprehensive dataset, they can be mined for purposes other than that for which they were originally intended. By applying the NSRL process to the NARA dataset, we can assist with data reduction, management and cataloging.

At the file level, the metadata collected include "hard" data, such as file name, file size, and routine cryptographic hashes of the file content - useful for uniquely identifying individual files - and "fuzzy" hash values, which are based on analysis of the structure of file contents and are useful in the detection of files which are similar but not identical. At the sub-file level, the metadata consist of cryptographic hashes of a file's constituent blocks.

Data reduction is achieved by comparing the "hard" metadata of every file in the corpus and using the information to detect and discard duplicate files, replacing them with references to a single (or a very small number of) master copies. This process is totally automated and does not require input from or supervision by an archivist.

Once exact duplicates have been discarded, the remaining unique files are compared using the "fuzzy" metadata and block-level metadata and compiled into clusters of similar files. The cluster data is available for inspection by archivists and to aid in data management and cataloging.

Metadata, Data Preservation, Data Reduction

D30 Virtual Machines in Computer Forensics Research

John Tebbutt, and Douglas White, MS, National Institute of Standards and Technology, 100 Bureau Drive Stop 8970, Gaithersburg, MD 208998970*

After attending this presentation, attendees will learn about some of the ways in which virtual machines can be used in computer forensics research to expedite the research process while providing more detailed information on the machines under observation.

This presentation will impact the forensic science community by showing how virtual machine technology is a significant addition to the toolkit of computer forensics researchers, facilitating adherence to the scientific model by enabling high-resolution capturing of machine states for investigation.

Virtual machines (VMs) are increasingly used by computer forensics investigators because they offer numerous well-documented advantages over physical machines. Computer forensics researchers also have found virtual machine technology to be of great use, for somewhat different reasons. Principal among these are the potential to create small (4GB or less) virtual drives; the ability to freeze or snapshot these drives while the machine is in a particular state; the ability easily to store such snapshots indefinitely (e.g. on a DVD); and the ability to investigate several such VMs simultaneously and over time on a single physical workstation.

VM technology has been helpful in the observation of changes in system characteristics as a result of specific actions. A snapshot of a machine in a known state is taken, an action performed, a second snapshot, taken and the two snapshots are compared in order to determine the consequences of the action. It is then a simple matter to return to the known state, perform different actions, and identify any patterns which may exist. The NSRL has used this approach primarily to examine changes occurring as a result of software installation: which existing files are changed, and how; which files are added; and what is the effect on the Windows™ registry?

VM technology is used to obtain coverage statistics for the NSRL data set. The NSRL derives its reference data directly from installation media, which raises the question as to the utility of the reference data when compared with files installed on computers. Using VMs, it is possible rapidly to quantify the coverage of the NSRL data set with regard to real systems. Beginning with a "bare metal" install in a VM, it was possible to investigate which operating system files are not found in the NSRL data set, progressing to known applications, and so on. Previously it had been necessary to attempt coverage estimates using arbitrary machines operating in everyday environments and with incompletely known installation histories.

Finally, VMs are occasionally used in the production of the NSRL reference data. For example, a new operating system is installed into a VM with a 4GB virtual hard drive, the VM is shut down, and the virtual hard drive is written to a DVD. The virtual hard drive can then be processed in the same way as an installation disc to obtain file hashes for inclusion into the NSRL data set. It can then be stored together with the installation media, rendering the process repeatable and verifiable. While this approach is labor intensive, there are circumstances in which it can be useful, for example, when files are stored in unknown proprietary archive formats on the installation media and would thus otherwise be unavailable for processing.

Virtual Machine, Machine State, Computer Forensics

D31 Internet Café

Jeffrey Barefoot, Department of Defense, Computer Forensic Laboratory, 911 Elkridge Landing, Suite 300, Linthicum, MD 21090*

After attending this presentation, attendees will understand how a suspect of a crime, without eyewitnesses, can be determined through the use of digital forensic tools and examination of computer data remnants.

This presentation will impact the forensic community by showing that digital forensics can provide valuable leads to a crime even when similar cases have failed or eyewitness testimony is not available. This presentation can also increase awareness that administrators of Internet cafés, that provide computers, should implement robust user management techniques to deter misuse of their resources.

Jeff Barefoot has been a computer forensic examiner at the Department of Defense Computer Forensics Laboratory (DCFL) for approximately four years. In August 2006, a follow-on examination to a Project KIDS (PK) case for additional analysis of media seized from an Internet café computer was initiated and assigned to Mr. Barefoot. Most case requests provide a subject and allegations of a crime. In the follow-on examination, the subject was unknown. Initial analysis revealed only one user profile that was identified as a generic Internet café account. Individual accounts are generally not created on Internet cafés because of the high volume of users. Mr. Barefoot's previous cases attempting to correlate a user associated with a computer crime on an Internet café had been unsuccessful. The forensic analysis was aimed at searching the media for chat or email messages during the timeframe of four images of suspected child pornography that had been recovered in the previous case.

Forensic analysis recovered creation times of the four images, where two of the images were found in a folder on the desktop and the other two images were found in a folder in the recycle bin. While no temporary Internet history records were recovered, there were four Yahoo!® Messenger chat messages that corresponded to the same creation times of the recovered picture files. In a review of the chat messages, one chat dialog revealed a Yahoo!® user account name and a connected Yahoo!® buddy icon picture to the username were revealed. This particular chat dialog displayed an individual chatting to a purported 15 year-old-girl. The entire timeframe of the chat session occurred during the creation times of three of the suspected child pornography images. During further examination of HTML files found in web cache, Jeff was able to connect the Yahoo!® user account to a nickname and the last name of an individual. While reviewing recovered emails, Mr. Barefoot was able to connect a "Classmates" email that addressed the subject's first name, thereby now correlating the individual's first and last name.

Based on the files of the suspected child pornography recovered from the analysis, it was determined that the images originated from a web-based photo storage site named "Photobucket." During analysis of five web page files from "Photobucket" photos, two filenames corresponded with the filenames of the recovered child pornography pictures. Additionally, a larger picture appearing to match the individual in the Yahoo!® buddy icon picture was identified.

After forensic analysis of the submitted media, the case agent was provided with the first and last name of the individual, the Yahoo!® buddy icon picture, and the larger picture retrieved from the Photobucket website. Subsequently, the case agent went to the personnel office and was able to successfully pull the individual's ID card, which revealed a perfect match to the information provided by DCFL. When confronted and interrogated, the subject confessed to viewing child pornography on the submitted Internet café computer and an additional café computer. An addition Internet café computer and the subject's personal computer was later sent to DCFL for forensic analysis, and additional images of suspected child pornography were recovered.

Yahoo!® Messenger Chat, Buddy Icon Picture, Photobucket Website

D32 Tracking Computer Use With the Windows™ Registry Dataset (WiReD)

Douglas White, MS, National Institute of Standards and Technology, 100 Bureau Drive Stop 8970, Gaithersburg, MD 20899-8970*

After attending this presentation, attendees will have a basic understanding of issues involving Windows™ Registry forensic investigation.

This presentation will impact the forensic community by presenting a rigorous procedure and data set to support investigation of Microsoft Windows(tm) computer systems.

The NIST Windows Registry Dataset (WiReD) contains the changes to the Windows™ Registry caused by application installation, de-installation, execution or other Registry modifying operations. The applications are chosen to be of interest to computer forensic examiners.

WiReD is currently an experimental prototype. NIST is soliciting feedback from the computer forensics community to improve and extend its usefulness.

There are two tools associated with the WiReD effort which will be discussed. One tool generates a XML-based difference between two Microsoft RegEdit-generated Registry patch files. The other tool creates the WiReD dataset from difference files generated from the XML. The tools are currently implemented in Ruby (1.8.4) and were tested in Mac OS X 10.4 (Tiger). Portability to other BSD-style operating systems will be discussed. Documentation for the tools and associated libraries will be provided.

Future directions of the WiReD prototype will be outlined. Limitations of using RegEdit to generate Registry dumps and handling problematic Registry entries will be discussed. The task and prioritization of identifying, acquiring and processing software for inclusion in the dataset will be discussed.

It is envisioned that the current prototype as only a small step in a much larger scheme that includes an XML database for managing the Registry difference files. This will allow for the efficient query and manipulation of acquired Registry data. Another goal is acquisition and cryptographic hashing of all files installed or modified by an application of interest. Expansion of Registry modification detection to beyond just application installation to include all phases of an application's life cycle on a given machine is the long term forensic information we seek.

Microsoft Windows, Registry, Registry Forensics

D33 Identification and Reconstruction of Deleted, Fragmented DNA Digital Files

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The objective of this case study is to describe a methodology to identify, reconstruct, and validate deleted file fragments. This methodology is predicated on a thorough understanding of the content structure of the file format and file-system level structures.

This presentation will provide the forensic community with details about a process used to identify and recover files from a reformatted drive by using file structure and file-system characteristics, which in turn were utilized to develop a programmatic and elegant solution to a challenging and complicated task. The case presented involved not only identifying the file fragments of the deleted file, but also reconstructing the history of the drive, including the file-system structure of the drive before it was reformatted.

Identification and reconstruction of deleted, fragmented files is a time consuming and often difficult process but it can be worth the effort, particularly when the results are a matter of life or death. The case study presented will detail the identification and recovery of deleted files from a

hard drive that had been re-initialized with different volume parameters from the original drive format. The recovered files contained the DNA analysis results of a crime scene sample that were relevant to a multiple homicide investigation and death penalty trial.

Traditionally, identification of deleted files has been most successful when plain text content is searched for in unallocated space. Documents such as word processing documents, spreadsheets or Internet HTML files may be identified with relative ease in unallocated space, even in fragmented form. Nevertheless, in only a few cases is an original file able to be reconstructed from recovered file fragments.

This case study provides an example in which only the first fragment contained a searchable keyword. Fragmentation on the drive made it impossible to reconstruct the files using available tools. The existence and location of the first file fragments were identified through keyword searches formulated by researching the file format and the standard nomenclature used by the laboratory that had analyzed the original DNA samples. One method available to identify the remaining associated file fragments would require a manual “trial and error” approach to combine random clusters and attempt to validate the combined file.

Instead, the authors developed, and will present, an alternative method using a customized program to search for and identify the associated file fragments that relies upon the characteristics of DNA digital files and individual attributes of the specific, relevant files. The program searched through every cluster of the relevant hard drive for the associated second file fragments, and returned only one hit for each deleted file fragment. The file fragments were reconstituted, and the resulting files tested and validated with DNA analysis software.

Fragmented Files, Reconstruction, Deleted Files

D34 Built for Speed: Using Bloom Filters for File Identification

Douglas White, MS, National Institute of Standards and Technology, 100 Bureau Drive Stop 8970, Gaithersburg, MD 20899-8970*

After attending this presentation, attendees will understand some principles of storing, accessing and sharing digital file identification data in Bloom filters.

This presentation will impact the forensic community by calling attention to the Bloom filter as a storage mechanism; a probabilistic algorithm to quickly test membership in a large set using multiple hash functions into a single array of bits.

A list of cryptographic hash values from NIST’s NSRL RDS 2.13 was mapped 16-byte (MD5) and 20-byte (SHA-1) integers and concatenated them to form a binary file. This is the most compact form we have found that preserves order and allows perfect matching. The binary file can be used to determine if an MD5 or SHA-1 is known in the NSRL.

At this time, the Bloom filters with which we are experimenting are stored in 512MiB files. The files have a header, a 2³² bit (512MiB) Bloom bit map section, and may contain data after the bit map.

Tools for manipulating the bitmap data will be discussed. The implementation varies in the number of Bloom vectors used - 16 vectors for MD5, 20 vectors for SHA-1. The effects of changing the Bloom key size, vector count and number of inputs will be explained.

There are benefits and pitfalls to both Binary tree and Bloom filter search methods, which will be covered in this discussion. Our math shows that a Bloom filter with 35-bit keys, using 20 vectors can store 1,000,000,000 SHA-1 values with a 1-in-100,000,000 false positive rate, and be stored in 4GiB. Other speed, storage and distribution benefits of Bloom filter use will be shown.

Bloom Filter, File Identification, Digital File Storage

D35 Hashing of File Blocks: When Exact Matches Are Not Useful

Douglas White, MS, National Institute of Standards and Technology, 100 Bureau Drive Stop 8970, Gaithersburg, MD 20899-8970*

After attending this presentation, attendees will understand some principles of eliminating benign information from investigations of computer systems, based on cryptographic hashes of files and partial files.

This presentation will impact the forensic community by introducing the rigor of cryptographic digital file identification at a granular level which supports statistical identification of objects.

Use of cryptographic hashes or “digital fingerprints” to automatically identify files is absolute when applied to a file as a whole; the file is unambiguously categorized. When dealing with morphing digital objects, such sorting leaves many files to be dealt with by manual review.

Block hashing is a method of applying the cryptographic algorithms to smaller-then-file-size portions of the suspect data. In this case study, the portions align with the blocks of the computer’s hard disk. The aggregation of the unambiguous block hash values allow statistical probabilities of identification of suspect files, taking the dynamic nature of digital objects into consideration. This is parallel to the use of latent fingerprints from a few of a suspect’s fingers rather than a complete tenprint set for identification.

Examples of practical applications of this technique, along with preliminary error rates will be presented.

Automated Investigation, File Hash, File Fingerprint

D36 Using Hashing to Improve Volatile Memory Forensic Analysis

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After attending this presentation, attendees will understand how information extracted from known files can improve volatile memory analysis and they will have insight into how automated tools can be built that leverage this information.

The presentation will impact the forensics community by demonstrating new methods of forensic volatile memory analysis, discussing how to derive trust in the data extracted from a potentially compromised system, and finally introducing a new resource being made freely available to the digital forensic community to support volatile memory analysis.

By extending hash databases to include immutable code sections of known executable files, an investigator can greatly augment the current techniques used for analyzing the volatile memory. This information can be used to automatically identify known aspects of the system’s runtime state, thereby reducing the areas of volatile memory that need to be analyzed during the investigation. Since these immutable sections are compiler generated text, they can also be used to evaluate the runtime state of a potentially compromised system. This can be accomplished by evaluating the in-memory code sections of critical system executables that should not change if the system is in a trusted state. Also, by leveraging these static sections of code as anchors of trust, the investigator can evaluate the control flow integrity of the system at the time the memory image was acquired using a notion of transitive trust. This allows investigators to detect common mechanisms used to undermine the integrity of the system and compromise the integrity of the data collected

from the system. By automatically identifying these changes to critical sections, it can also provide an investigator the mechanism to quickly triage the system and, if necessary, focus their attention on the time-intensive effort of determining the intent of the modifications.

This work will also discuss why the information currently stored in hash databases is inadequate to support the needs of the volatile memory community. It will also provide insight into the challenges associated with collecting this information. Outlines of the procedures that are needed to normalize the data extracted from the known files and of the procedures that need to be followed to extract and normalize the immutable code from volatile memory will also be presented.

A major goal of this effort is to provide freely available standard reference data, to support the needs of digital investigators and tool makers that are currently using this type of information. By leveraging the National Institute of Standards and Technology (NIST) National Software Reference Library (NSRL) it was possible to augment the Reference Data Set (RDS), a freely distributed collection of digital signatures for known applications, to include hashes of these immutable sections of data which will provide a valuable resource to the volatile memory analysis community.

Finally, the results of a number of experiments performed on both laboratory and real-world systems will also be presented. These experiments will attempt to demonstrate the impact of leveraging these techniques to improve volatile memory analysis.

Volatile Memory Analysis, Identification, Trust

D37 Potential Anomalous Results - Calculation of One-Way Cryptographic Hashes in Universal Serial Bus Devices

Mark Pollitt, MS, J. Philip Craiger, PhD, Chris Marberry, BS, and Paul Burke, BS, National Center for Forensic Science, University of Central Florida, PO Box 162367, Orlando, FL 3281*

After attending this presentation, attendees will develop an understanding of the interplay between USB storage devices and cryptographic hashing tools.

This presentation will impact the forensic science community by. As a result of attending this session, examiners may be able to avoid incorrectly interpreting the results of hashing algorithms and will be able to develop protocols which will prevent obtaining incorrect results.

One-way cryptographic hashes (or 'hashes' for short) are mathematical algorithms applied to digital media. A common use of hashes in forensics is to demonstrate that digital media has not changed (i.e., not been tampered with subsequent to seizure). The application of a hashing algorithm to a piece of digital media (a file, a forensic image, etc.) should always result in the same unique number, typically of size 128 or 160 bits depending on the particular hashing algorithm used. Change of a single bit on the digital media will result in a significant change to the resulting hash, indicating that the contents of the media have changed.

While developing simulated forensic evidence for teaching purposes, anomalous hash values were noted using certain combinations of imaging tools and Universal Storage Bus (USB) storage devices. The differences noted were limited to instances where the imaging tool was attempting to obtain an image of the "physical" drive.

One significant difference in the data structures for USB devices is that they normally lack a partition table. It is therefore possible that imaging software may make erroneous assumptions concerning the size of the media resulting in an image that is either the incorrect size or the included data bytes are different from what is read by another imaging tool.

Storage drives which utilize "autoplay" technology are becoming very common. Initial examination of these reveals that they may contain applications which change information on the USB drive, which could result in an altered hash value.

Given the increasing number, size and importance of USB devices, it is important to ensure that complete and accurate images are created from the original evidence.

Digital Forensics, Cryptographic Hash, Universal Storage Bus (USB)

D38 Acquisition Techniques of Mobile Devices and Associated Media

Richard P. Ayers, MS, National Institute of Standards and Technology, 100 Bureau Drive, Mail Stop 8970, Gaithersburg, MD 20899-8970*

The goal of this presentation is to provide an overview on mobile device forensics and suggested procedures during the acquisition phase of GSM devices and associated media.

This presentation will impact the forensic science community by providing a brief overview on mobile device forensics and suggested procedures during the acquisition phase of GSM devices and associated media.

Mobile devices incorporating cellular capabilities are ubiquitous and contain a wealth of personal information useful in criminal cases, civil disputes, employment proceedings and recreation of incidents. Data acquisition performed on cellular devices operating over Global System for Mobile Communications (GSM) and non-GSM networks has proven not only frustrating but extremely tedious due to the rapid rate of new cellular devices appearing on the market. Software vendors specializing in cellular forensics are forced to continuously provide updates to software and associated hardware in order to maintain support and provide examiners with solutions for the latest technologies. Multiple hardware and software solutions exist which provide acquisition solutions for various makes and models of cellular devices and associated media. Forensic examination of mobile devices is a small part of computer forensics, in general. Consequentially, tools possessing the ability to acquire data from these devices are slowly maturing and continually expanding. This paper provides a brief overview on mobile device forensics and suggested procedures during the acquisition phase of GSM devices and associated media.

Introduction: Cellular devices continue to expand in storage space (on the order of gigabytes) via associated removable media (e.g., Multi-Media Card [MMC], Secure Digital [SD], memory sticks) and internal hard drives allowing mobile devices to double as mp3 players and personal organizers. Additionally, the intelligence of these devices continues to advance. Personal Information Management (PIM) applications provide functionality comparable to those present on older desktop personal computers. The combination of ever-increasing storage capacities, built-in camera and video functionality alongside faster processing and Internet ready devices, provide users with the ability to store an abundance of personal information. Consequentially, the advancement in technology has escalated the richness of data contained on cellular devices. Therefore, cellular devices are often the key component to solving an incident or bringing justice to involvement in criminal activity.

Data acquisition of mobile devices entails availability of appropriate hardware and associated drivers used to establish connectivity with a software application capable of interpreting and presenting acquired data in a human readable format. Forensic manufacturers are challenged with producing new hardware (i.e., data interface cables) and software (i.e., drivers) which provide forensic examiners with an acquisition solution for emerging technologies. Unlike hard disks whose interface (e.g., Advanced Technology Attachment [ATA], Serial Advanced Technology Attachment [SATA], Small Computer System Interface [SCSI], Universal Serial Bus [USB], Firewire [FW400/800]) standards are nominal, cellular devices do not have a pre-defined interface standard and vary based upon manufacturer and specific models. Non-standardization of mobile device interfaces often times forces examiners to borrow cables from another source (i.e., mobile device acquisition toolkit) in order to acquire the

device. The worst-case scenario forces examiners to physically “thumb” the device while recording the process via video camera, where screenshots are used to create a finalized report.

The evolution of forensic software and associated hardware capable of acquiring data from cellular devices is continuous, due to the turnover rate of mobile devices available on the market today. A lack of interface standards often times leads to acquisition complexities involving multiple toolkits yielding a successful acquisition. Therefore, quality control and rigorous testing of mobile device acquisition tools is paramount, in order to provide examiners with a sound application.

Characteristics: Forensic examiners, specialists and associated team members involved with the task of investigating mobile devices should encompass a general understanding of the mixed variety of architectural layouts contained within low to high end cellular devices, smart phones and PDAs (Personal Digital Assistants) embedding cellular technology. Knowledge of mobile device design architecture plays a significant role in device management throughout the life cycle of the investigation or incident. The type of memory present in a device is quite significant in terms of data preservation related to power conservation during transportation to a protected laboratory setting. Generally, mobile devices are comprised of the following elements: a micro-processor, memory, radio-module, digital signal processor, microphone, speaker and a variety of hardware keys that provide application functionality.³ However, differences in memory layout between low to high-end cellular devices compared to smart device determine the seizure and transit techniques minimizing the possibility of data loss.

Cellular devices (i.e., low to high-end cell phones), designed with the primary purpose of placing and receiving calls, maintain data in flash memory. Typically, the first part of flash memory is filled with the operating system and the second part is allocated for user data. Due to the design of these devices the conservation of power is not as critical as it is for smart devices. Cellular devices that maintain data within non-volatile memory are not subject to data loss via battery depletion. While the criticality of power maintenance is lessened, low to high-end cellular devices face the possibility of data loss via network connectivity overwriting recoverable deleted data or the possibility of a key-chord acting as a device restore feature.

The internal memory of smart phones is classically divided into two regions: Flash Read Only Memory (ROM) and Random Access Memory (RAM). Data stored in Flash ROM, such as the operating system (OS) and pre-loaded applications supplied by the manufacturer are hard-coded and protected against erasure during the event of a hard-reset or battery exhaustion. RAM is generally divided into two areas, program memory and an object store. Program memory (used for program execution, loading drivers, and storage for processing information) is cleared much like RAM on a personal computer. The object store retains data during active and quiescent states, but risks data loss in the event of battery exhaustion or a hard reset. Manufacturers may provide users of smart devices with an allocated safe-store folder for sensitive data that the user would like to protect against erasure in the event of a hard reset or battery depletion. Additional sources of memory storage present on high end devices are external memory (e.g., Secure Digital [SD], MicroSD, Multi-media Card [MMC], Memory Sticks) cards which provide users with a non-volatile storage solutions. Smart phones are high maintenance during transit to a protected laboratory setting due to the memory configuration and must be either shut down or powered while protected in a radio-isolated bag lessening the chance of data modification.

SIM Characteristics: The Subscriber Identity Module (SIM), a smart card that contains a processor, read only memory (ROM) and random access memory (RAM), is an essential element combined with the Mobile Equipment (ME) providing users the ability to authenticate and gain access to subscribed services for devices operating over a GSM network. In addition to providing users with extended non-volatile memory storage for personal information SIMs provide users with the ability to port their identity to multiple devices.³ The GSM 11.11 standard provides useful

information related to SIM characteristics, protocols and data elements. The SIM is approximately the size of a postage stamp and is typically located in the battery cavity area of mobile devices. Often times, multiple SIMs are used with a single device, therefore, it is important to carefully search surrounding areas and confiscate all related media or devices. Devices found without the SIM present may cause difficulty in acquiring the internal memory of the related device. Fortunately, tools exist that provide specialists with the ability to create an access card that allows internal memory acquisition to be completed without interruption.

SIMs provide subscribers with a layer of security via a 4-8 digit Personal Identification Number (PIN). Proper authentication is essential for network connectivity. Three incorrect successive authentication attempts lock the card forcing the correct PIN Unblocking Key (PUK) to be entered; if ten consecutive attempts are entered incorrectly the SIM is rendered useless. Therefore, it is advantageous for SIM acquisition tools to present the number of authentication attempts remaining if examiners are forced to attempt to crack the PIN. SIMs are generally pre-programmed with a default PIN, often documented on the manufacturers’ site, which may serve as a starting point when alternative means of PIN discovery are not available. Acquiring the contents of the SIM are extremely limited without proper authentication, therefore knowledge of the PIN is invaluable. An abundance of useful information is stored on the SIM such as Abbreviated Dialing Numbers (ADNs), Last Numbers Dialed (LND), Short Message Service (SMS) messages, Enhanced Messaging Service (EMS), subscriber information (i.e., IMSI), and location (i.e., LOCI, GPRSLOCI) information providing additional data separate from the internal memory acquisition of the ME.

A number of forensic software tools have emerged that deal exclusively with SIMs independently of their handsets. The SIM must be removed from the phone and inserted into an appropriate reader (e.g., Personal Computer/Smart Card [PC/SC] reader) for acquisition. The majority of SIM only tools concentrate on a subset of data (e.g., subscriber information, Abbreviated Dialing Numbers [ADNs], Short Message Service [SMS] text messages, call logs, location information [LOCI]) considered most useful as forensic evidence. Tools have begun implementing support for the creation of a radio-isolation card providing examiners with the ability to acquire devices without network interruption, via writable SIM cards. The ability to create an access card of a SIM provides “radio silence” during acquisition eliminating incoming data overwrites of potentially recoverable deleted information. Additionally, the creation of radio-isolation cards or access cards provides examiners with the ability to acquire the internal memory of GSM devices found without the SIM present.

Currently, Universal Subscriber Identity Modules (USIMs) are on the rise. The third generation (3G) card carries out the same functions as its 2G cousin (i.e., SIM) and offers users with greater bandwidth allowing for enhanced multi-media, communication, wireless Internet access and strengthened security mechanisms.

State of the Art Snapshot: The variety of cellular technologies present on the market today has given rise to a multitude of forensic toolkits providing forensic specialists with the ability to acquire data present on various makes and models of mobile devices and related removable media. A considerable number of software tools and toolkits exist, but the range of devices over which they operate is typically narrowed to distinct platforms for a manufacturer’s product line, a family of operating systems, or a type of hardware architecture. Although, the majority of toolkits support a full range of acquisition, examination, book-marking and reporting facilities, some tools focus on a subset that provide examiners with the ability to only acquire and produce a final report. Information present on a cell phone may vary depending on several factors such as the capabilities of the phone implemented by the manufacturer, network services subscribed to, or modifications made to the phone by the service provider and/or the user.¹

Tools capable of acquiring data from cellular devices may provide examiners with the ability to perform both a logical and physical acquisition. Often times this is dependent upon the device being acquired. Physical acquisition implies a bit-by-bit copy of an entire physical store

(e.g., a memory chip), while logical acquisition implies a bit-by-bit copy of logical storage objects (e.g., directories and files) that reside on a logical store (e.g., a file system partition). Physical acquisition has advantages over logical acquisition, since it allows deleted files and any data remnants present to be examined, which otherwise would go unaccounted. A logical acquisition, though more limited than a physical acquisition, has the advantage that the system data structures are normally easier for a tool to extract and provide a more natural organization to understand and use during examination. If possible, doing both types of acquisition is preferable – a physical acquisition before a logical acquisition.² Additional features of various mobile device forensic tools often protect case files or individual files from modification via encryption or SHA/MD5 hash functions.

Digital Evidence: The amount and richness of data contained on mobile devices varies considerably dependent upon device type and personal usage. Higher end devices such as smart phones or PDAs doubling as cell phones provide users with enhanced applications, capable of storing multiple file types while providing enhanced network connectivity. However, a core set of user data can be defined that remains somewhat consistent on all device types (i.e., low to high-end cellular device vs. smart devices) with cellular capabilities. GSM devices provide two areas of data storage, the internal memory of the device and the SIM. The following data elements stored on the SIM provide useful investigative or incident-solving information.

- Service Provider Name (SPN): The SPN provides examiners with the name of the provider useful for contact information in the event of needing additional SIM assistance.
- Integrated Circuit Card Identifier (ICCID): The ICCID (useful for obtaining the Pin Unlocking Key [PUK]) is the SIM serial number, which is imprinted on the outside of the card or can be acquired with the use SIM acquisition tool.
- International Mobile Subscriber Identity (IMSI): The IMSI is a unique number that identifies the phone/subscription to the GSM network.
- Mobile Subscriber International ISDN Number (MSISDN): The MSISDN is a number that identifies the phone number used by the headset.
- Abbreviated Dialing Numbers (ADNs) – ADNs are phone book entries that may contain a contact name in addition to the phone number.
- Last Dialed Numbers (LDN) – LDNs are a log of the last numbers dialed from the handset.
- Short Message Service (SMS) – SMS or text messages contain incoming messages sent to the device.
- Enhanced Message Service (EMS) – EMS messages are text messages over 160 characters or messages that contain either Unicode characters or a 16x16 to 32x32 black and white image.
- Location Information (LOCI) – LOCI information provides information relative to cell towers communicated with on the network.
- General Packet Radio Service (GPRS) location – GPRS/LOCI contains the routing area information for data communications over the general packet radio service.

The following data elements stored in the device's internal memory provide useful investigative or incident-solving information.

- International Mobile Equipment Identifier (IMEI) – A unique 15-digit number that serves as the serial number of the GSM handset useful for determining statistics on fraud or faults.
- Personal Information Management (PIM) data – Data that is associated with the Address book (e.g., name, phone number, email address, address, website) and Calendar entries (e.g., details such as contact name, time, and address, relating to previous and upcoming appointments), To-Do lists, Memos, etc.
- Call Logs – Incoming and outgoing calls in addition to the SIM are found in the internal memory of the device.

- SMS text Messages – Depending upon the device or user setup SMS messages may be stored on either the internal memory of the device or the SIM. Often times, once the maximum limit has been reached for incoming SMS messages on the SIM they will be stored on the internal memory of the device. Additionally, dependent upon the device and user-setup, outgoing messages may be stored in the device's internal memory in a sent folder.
- Multi-media Messages (MMS)/email – MMS messages/email messages are found in the internal memory of the device and have an audio, graphic or video clip associated with them.
- File Storage – File types such as audio (.mp3), graphic (.jpg) video clips (.avi) are often supported for many cellular devices (mid-level to high-end) and provide an excellent investigative source to examiners.

Preservation: Proper evidence preservation techniques must be strictly observed lessening the chance of data modification or deletion during the life cycle of the examination (i.e., initial seizure to final reporting). Maintaining the present state of mobile devices during transit to a laboratory setting can be problematic and challenging. For instance, a disposable or portable battery charger for the specific make and model of the device seized must be readily available. Maintaining power to the device eliminates the possible triggering of authentication mechanisms and loss of data contained in volatile memory as discussed earlier in Section 2.

Live devices require eradicating network connectivity via a radio-isolated container or radio-isolation card protecting against incoming or outgoing communication with the network. Incoming data alters the state of the device and potentially may overwrite recoverable deleted data. Additionally, any exposed cables used for maintaining power must be completely isolated to counteract the cable acting as an antenna negating the effect of the radio-isolated container. The Netherlands Forensic Institute (NFI) has developed an in-depth flow chart of preservation techniques when transporting seized mobile devices.

Data Acquisitions: Retrieving data from cellular devices and associated media must be approached methodically following specific techniques in order to preserve data present on the device. As mentioned earlier, cellular devices must be contained in radio-isolated containers or simply turned off during transit to eliminate the possibility of overwriting potentially recoverable deleted data. Turning off the device may trigger authentication mechanisms and prolong the acquisition process, therefore, use extreme caution when using this technique if radio-isolation is not optional. Deleted data elements such as: address book, calendar entries, text messages, and MMS messages can be recovered from the internal memory of the cellular device dependent upon the tool and type of allowable acquisition (physical vs. logical). Furthermore, data elements stored on the SIM are recoverable if proper seizure, transit and acquisition techniques are strictly followed. Contact with the network can potentially destroy data stored either in the internal memory of the device or data stored on the SIM. Tools that traverse and report data stored on the SIM during internal memory acquisition have been noted to change the status of text messages. For instance, one traversal of the data present on the SIM will report an unread SMS message as unread; the second read due to the first traversal changes the status to read. The slight modification could have significant bearing on resolving an incident or criminal activity. Therefore, a thorough understanding of proper acquisition techniques and operations will lessen the chance of modifying existing data. Additionally, data elements that need to be handled carefully to defend against modification or deletion are the call logs (i.e., last numbers dialed). The SIM should never be removed from the phone before internal memory acquisition and additional SIMs found should not be inserted into the target device. Switching out SIMs alters the data stored in the internal memory of the device.

Conclusions: Forensic examination of cellular devices is a growing subject area in computer forensics. Therefore, cell phone forensic tools are a relatively recent development and in the early stages of maturity. Acquisition of data contained on mobile devices is effected by numerous

variables such as the type of device being acquired (i.e., low-end versus high-end) and the techniques used during seizure, transit, acquisition, and storage throughout the life-cycle of the investigation or incident.

The goal of this paper is to provide a brief overview of variables and situations to consider when acquiring a mobile device and associated media. Accurate acquisition techniques and methodologies must be adhered to, yielding optimum results. Moreover, continuous education of executing proper forensic techniques and possessing a profound understanding of the examined mobile device and associated application is paramount when handling digital evidence tied to an incident or criminal investigation.

References:

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- 2 Jansen, W., Ayers, R., 2007, SP800-101, Guidelines on Cell Phone Forensics, URL: <http://csrc.nist.gov/publications/nistpubs/800-101/SP800-101.pdf>.
- 3 Jansen, W. Ayers, R. 2006, Forensic Software Tools for Cell Phone Subscriber Identity Modules, Conference on Digital Forensics, Association of Digital Forensics, Security, and Law (ADFSL), <URL: <http://csrc.nist.gov/mobilesecurity/Publications/JDFSL-proceedings2006-fin.pdf>.

Mobile Device Forensics, Cellular Forensics, Digital Forensic Tools

D39 Smart Unpacking Research: Using Mathematics to Unpack More

Benjamin Long, BA, National Institute of Standards and Technology, 100 Bureau Drive, Stop 8970, Gaithersburg, MD 20899*

After attending this presentation, attendees will learn new methods, developed by author, to elicit as well as validate structure and content using mathematically-based techniques. Attendees will not only learn the details of the methods, but also their development and use to date for accomplishing the objectives of the NSRL – to provide more file-identifying information and to validate the accuracy and completeness with which that information has been extracted.

This presentation will impact the forensic community by introducing new methods for analyzing and thinking about the issues of content analysis, data extraction, and measurement of these operations.

This work presupposes that digital content can be characterized and classified according to mathematical properties and structures. How this can form the basis for new kinds of analyses as well as a foundation for validation and measurement of the structures discovered will be discussed.

The idea of unpacking content from within another structure is a very general notion. It encapsulates a large portion of the activity in computer forensics to date.

The National Software Reference Library (NSRL) Project was formed to reduce the workload of investigators as they sought to separate what files constituted evidence of user activities and what files did not. The NSRL provides databases of file-identifying information (FII) for the purposes of reducing the number files that must be investigated, among other things. A large portion of the work involved in providing this data is performed by unpackers – tools and methods utilized to extract embedded files from compound files such as archives, compressed files, and so forth. Extracting such files increases the amount of file-specific information that may be provided.

The rate of appearance of new compound structures often exceeds that of corresponding unpacking methods. This is largely due to the fact that most unpacking is performed by pre-written tools that understand these structures and can extract their contents for processing. This problem also reflects a more general problem in forensics: accurate comprehension

and/or extraction of embedded content in a timely manner. This problem is often addressed in a largely manual, time-consuming manner by those who create unpackers. In addition to the time lag introduced by these methods, there are few, if any, methods for validating the accuracy or completeness of their unpacking functions. Thus, users are often left to settle for whatever is provided to them.

Smart unpacking research was born to address these issues in a new way. The problems are addressed mathematically by identifying and locating the invariant meta-patterns of digital content. This allows the characterization and extraction of embedded content without necessarily requiring pre-written unpackers. These methods are also utilized to form measurements as to the completeness and accuracy of a given unpacking method for a given compound file or meta-structure.

This research, although new, has yielded some very promising results that suggest not only the soundness of the concept but perhaps a new approach to these problems in general. This talk presents the findings to date and demonstrates their use in practice.

Mathematical Content Analysis, Data Measurement, Content Validation

D40 Computer Forensic Tool Quirks Uncovered During Testing

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After attending the presentation, attendees will be made aware of several unexpected behaviors exhibited by computer forensic tools used in the acquisition of digital evidence. The practitioner can then either avoid the conditions that generate the behavior or take steps to mitigate the results.

The presentation will impact the forensic community by increasing awareness in the community of some tool behaviors that are unexpected and may have implications for examination of digital data and presentation of results.

The Computer Forensics Tool Testing (CFTT) project at the National Institute of Standards and Technology develops methodologies for testing computer forensic tools. The authors have applied the developed test methodologies to several tools in the areas of disk imaging and write blocking.

Disk imaging involves acquiring an image of either a physical hard drive or a disk partition, also called a logical drive. A disk imaging tool functions by reading each sector from the drive to be examined and creating either an image file or a clone of the original on a similar device. An image file contains all information to exactly reconstitute the original hard drive. While an image file may be stored as a bit for bit copy of the original, it is usually compressed in some way to save space. During testing of disk imaging tools it was observed that under the correct conditions for some tools the following behaviors:

- a tool incorrectly determines the size of a hard drive to be acquired,
- the last sector of a hard drive is not acquired,
- the last sector of a partition (logical drive) is not acquired,
- a few sectors near the end of an NTFS partition are acquired incorrectly,
- hidden areas of a hard drive are not acquired,
- a tool tries alternate read instructions if a faulty sector is encountered,
- readable sectors adjacent to a faulty sector are not acquired, and
- a restored hard drive is not identical to the original acquisition.

Write Blocking is used to protect original digital data from modification during acquisition or preliminary inspection to determination relevance to an investigation. A write blocking tool functions by inserting itself between the data to protect and the application accessing the data.

Any operations that might change the data are intercepted and blocked. Write blocking can be implemented either in hardware or software. While there are advantages and disadvantages to both, hardware write blocking devices are more widely used. Usually access to digital data from a storage device is by a command set that implements some access protocol. Typical examples are BIOS commands, ATA commands and SCSI commands. These command sets usually implement several read and several write commands. During testing of write block software and hardware we have observed the following:

- blockers are designed in one of two ways: either (1) to block any write commands and allow any other commands, or (2) allow any read commands and block anything else, access protocols change over time and new commands are introduced, and some blockers may allow acquisition of protected data but, an operating system may not be able to mount a file system from a protected drive and hence a preliminary examination may not be possible.

Digital, Software, Testing

D41 Behind Armor Blunt Trauma Injuries in Law Enforcement From Ballistic Impact: Body Armor Assessment

Sarah E. Stojisih, BS, and Cynthia Bir, PhD, Wayne State University, 818 West Hancock, Detroit, MI 48201*

During this presentation, attendees will gain knowledge of the different types of injuries caused by ballistic impacts to the armor-protected regions, the injury mechanics, and the effects to end users. The types of injuries that occurred, the extent of the injury, and the lasting effects will be discussed for key cases.

The data that is yielded by this research project will help the forensic science community by better protecting the law enforcement officers that protect the citizens. This research will provide valuable insights that will ultimately drive new standards of officer care, provide recommendation for changes to the current certification standard, allow for validation of current research models and improve the collection and analysis of vests that have protected officers from a ballistic impact.

Over 3,000 police officers have been saved due to utilization of a bullet proof vest.¹ The International Association of Chiefs of Police (IACP) and DuPont have joined together to capture these cases in one database. The IACP/DuPont Survivors' Club database provides a means for examining this group of case studies using specific criterion such as threat and region of impact. The goal of the current research effort is to assess the types of injuries caused by ballistic impacts to the armor-protected regions as well as the potential mechanisms of injury.

Prior to commencement of the study, approval was garnered from the Wayne State University Human Investigation Committee. Permission to access this database was granted for this project by IACP, DuPont, and "third parties for the purpose and enhancement of law enforcement officer safety." The information regarding each injury was acquired from three different sources. First, consenting members of the Survivors' Club were asked to complete a questionnaire via a telephone interview, which was adapted from the current version of the Survivors' Club application. Second, the participants were asked to release medical records related to the injury including records from both the initial emergency room visit and follow-up medical treatment. Finally, the police records for each of the participants' cases were requested to enhance the information obtained through the phone interview and medical records.

A total of 453 letters were mailed to those identified in the IACP/DuPont Survivors' Club database fitting the criteria. A second letter was sent in December 2006 to remind officers about the study. A total of 56 officers agreed to participate. Medical records were procured from 36 of the survivors and follow up interviews were conducted with 29 of the

survivors. Of the 56 cases, 29 of them exhibited remarkable examples of the behind armor blunt trauma (BABT). BABT occurs when a high velocity low mass projectile, such as a bullet, strikes the body armor and causes an injury. Minor injuries that coincide with a BABT include superficial or severe bruising, abrasions, and some superficial lacerations. According to the Abbreviated Injury Scale (AIS) 2005, 10 of the cases were considered AIS 410402.1, which indicates that these cases were mild contusions to the thorax region. Three of the cases were considered a combination of both AIS 410402.1 and AIS 410602.1 with both mild contusion and laceration to the thorax region. Two cases were considered AIS 510402.1 denoting mild abdominal contusions.

A few notable cases present with more serious injuries from BABT. The first case involved severe bruising with approximately one inch in diameter of skin necrosis in the thorax region. This is uncommon and more research is needed to determine the exact cause of the injury. A second case involved an injury that is becoming more common due to the increase flexibility of newly developed armor. This injury has been referred to as a backface signature injury or "pencil" and involved a one inch open wound in the abdomen. Two of the cases involved rib fractures due to the blunt force trauma. The final notable case involved a bullet hitting within 1/16 of an inch from the edge of the vest and penetrating the vest. These select cases will be presented in detail.

The data that is yielded by this research project will help humanity by better protecting the law enforcement officers that protect the citizens. This research will provide valuable insights that will ultimately drive new standards of officer care, provide recommendation for changes to the current certification standard, allow for validation of current research models and improve the collection and analysis of vests that have protected officers from a ballistic impact.

Reference:

- ¹ *IACP/DuPont Kevlar Survivors' Club* 2007, International Association of Chief of Police and DuPont. http://www2.dupont.com/Kevlar/en_US/uses_apps/law_enforcement/survivors_club.html.

Behind Armor, Backface Signature, Wound Ballistics

D42 The Importance of Forensic Photography in Domestic and International Forensic Operation

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After attending this presentation, attendees will have an increased understanding of the important role of forensic photography in domestic and international forensic operations.

Detailed photographic documentation is part of any forensic work. Specialists from many different fields often rely heavily on photographs to illustrate their work processes and results. Photos are acknowledged to be a very powerful tool in presenting forensic evidence to a non-scientific audience of law professionals and jury members in court. Despite the almost universally recognized and accepted importance of photography in forensic investigation, the photos are most often taken by insufficiently trained law enforcement personnel or by the forensic scientists themselves.

The reason for that is the common but misguided belief that anyone can take good photographs. A belief that has been recently been strengthened by the arrival of digital and therefore instantly reviewable photography. This has led to far more images being taken but certainly had no positive effect on quality levels.

It is true that most people can take photographs and most of those will be acceptable. But to take good photographs, which can illustrate and accurately document evidence and processes, proper, standardized training

and experience is necessary. In this, forensic photography is no different to any other profession. To acknowledge that forensic photography with its often challenging light and environmental conditions is a specialized field that needs equally specialized and appropriate training, is the first step in the right direction.

This presentation will show several different aspects to and roles of photography in forensic operations. It emphasizes the benefits the judicial system can experience if photography is not just limited to simple evidence documentation and how a more comprehensive approach to forensic photography can strongly support other forms of documentation and therefore strengthen the legal process. The presentation will highlight a few key principles of forensic photography and how proper standards can be achieved.

Through a number of examples, the presentation will show how beneficial photography can be to prosecutors' offices and the courts, as well as demonstrating how insufficient photography can leave the expert witness in the difficult position of not being able to demonstrate their work and results to its optimal potential. Every forensic practitioner must be aware that a photograph not taken or taken badly is a missed opportunity, which can very rarely be rectified. Many forensic processes happen only once and can not be repeated.

It will also be demonstrated how non-forensic, humanitarian missions can enjoy the same benefits from high quality photography.

Although the importance of good photographic evidence is obvious, operations with limited budgets may be reluctant to commit to employ a full time photographer. This difficult and understandable position many teams find themselves in will be addressed and possible solutions presented.

Forensic Photography, Evidential Photography, Methodological Documentation

D43 Impact of Forensic Evidence on Solvability in Child Abduction Murder Investigations

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The goal of this presentation is to assist police investigators more timely and efficiently identify forensic evidence which will contribute to the solution of child abduction murder cases.

This presentation will impact the forensic science community by improving the efficiency and effectiveness of the investigation process in child abduction murder cases.

There is a paucity of research which addresses the role forensic evidence plays in murder investigations of abducted children. Only two researchers, Hanfland et al. (1997) and Brown (2005) present descriptive statistics about the types of forensic evidence found in murder investigations of abducted children. Unlike murders in general, in which weapons are collected as evidence in almost 40% of cases, weapons are collected as evidence in only 17 to 20% of child abduction murder investigations (Hanfland et al., 1997; Brown, 2005). The most common evidence collected in these types of investigations is hair (26.1%) followed by weapons (20.0%) (Brown, 2005). Brown (2005) found that finger and shoe prints (18.0%), semen (17.2%), fibers (15.9%) and blood (14.3%) were found in investigations in substantially the same percentages as Hanfland et al (1997).

In addition to evidence that was left behind by the offender at the crime scene, Brown (2005) examined whether or not the offender deliberately discarded evidence after the murder. Discarded evidence was found by police in 24.2% of child abduction murders (Brown, 2005). This was a slight increase from 21% in a previous study (Hanfland et al., 1997). Of that discarded evidence, 36.0% was found along the roadway on which the killer traveled in the course of the murder, body disposal, and escape

(Brown, 2005). This is a decrease from the 50% previously found in the Hanfland et al. (1997) study. Brown (2005) found that evidence was found along the roadway within one-mile of the Body Recovery Site in 56.5% of cases. This statistic was slightly less than the 59% reported by Hanfland et al. (1997). This statistic has important investigative implications for child abduction murder investigations because an investigator is likely to find evidence discarded by the offender within a one-mile radius of the body recovery location (Hanfland et al, 1997; Brown, 2005).

These studies provide valuable information to police investigators on the probability of certain types of evidence to be recovered at the murder incident component locations. However, to date, no researcher has addressed the impact of forensic evidence on case solvability in murder investigations of abducted children. This is surprising considering the increasing impact of forensic evidence in the solvability, clearance and conviction of offenders. This presentation will address the impact of physical evidence left by an offender on case solvability in murder investigations of abducted children. In particular, the impact of hair, weapons, finger, foot or shoe prints, semen, fibers, firearms, bite marks, tire tracks, trace evidence, blood and fluids evidence will be examined.

Forensic Evidence, Child Abduction Murder, Solvability

D44 DNA Typing From the Recovery of Latent Body Print Residue From Visual Substrates

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This presentation is focused on the ability to recover DNA from smears and unknown body prints at crime scenes which have been deposited onto various substrates commonly located within crime scenes.

This presentation will impact the forensic community by reporting results of research conducted by Army and Air Force Special Agents, with a Fellowship at the Office of the Armed Force Medical Examiner, and through the assistance of the Armed Forces DNA Identification Laboratory (AFDIL). Significant full and mix sample loci were recovered from various samples made to replicate objects normally located within a crime scene, after a "subject's" face and/or forearm came in contact with various substrates after a simulated struggle.

The process of identifying persons responsible for the commission of crimes relies upon the detection and recognition of individualizing characteristics that can only be attributed to one suspect. The two most common methods of definitively identifying criminals from evidence recovered at crime scenes are fingerprint and DNA identification.

Advances in DNA analysis have allowed for the detection of trace DNA within fingerprints found at crime scenes, though the chances of recovering a complete DNA profile do not yet justify the destruction of a usable fingerprint. There are, however, numerous latent prints deposited by areas of the body, beyond the fingertips, that are left at the scenes of many violent crimes. In fact, non-fingerprint latent body prints constitute approximately 35% of the latent impressions left at the scene. To date, these items of evidence have been a relatively untapped resource, as there has been insufficient interest and study of these prints in the United States.

A common complaint about using non-finger body prints for identification is a lack of standards that denote what constitutes identification, and a lack of body print databases to house reference samples. Further, the origin of various body prints and smears made by skin surfaces, other than fingerprint and footprint, may not be recognizable as originating from a specific part of the body. But the DNA is there.

With advances in trace DNA analysis there is now a use for non-finger body prints and smears recovered from crime scenes. Because the impressions deposited by various body surfaces are comprised of the same contaminants from which DNA has been extracted from fingerprints, namely sweat and sebum, there exists a realistic probability that swabs of latent body prints will yield a sufficient amount of DNA-containing epithelial cells to allow for the generation of a suspect DNA profile.

Methods and results of research conducted will be presented with the Armed Forces DNA Identification Laboratory to share and stress to the forensic community the need to collect unidentifiable latent body smears or prints identified at crime scenes for comparison to suspect DNA samples.

Prints, DNA, Residue

D45 Detection of Air Gun Pellet Wipe Using Digital Infrared Photography

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After attending this presentation, attendees will understand: (1) a procedure for recording digital infrared images of air gun pellet wipe patterns on dark and multi-colored fabric, and (2) the advantages and disadvantages of using digital infrared photography to enhance pellet wipe images.

This presentation will impact the forensic community and/or humanity by discussing the detection of pellet wipe on dark colored fabrics using digital infrared photography in a way that will enlighten those who investigate crimes involving the discharge of air guns.

The purpose of this presentation is to present the results of a study for recording digital infrared images of air gun pellet wipe patterns on dark and multicolored fabrics. When lead or lead alloyed air gun pellets perforate fabric, they produce a discolored area around the pellet hole margin. The discoloration is similar to bullet wipe; however, pellet wipe does not contain any cartridge components such as propellant residue, prima residue, soot, or bullet lubricant compounds. Pellet wipe produced from air guns discolors fabric with residue from traces of the pellet and oil residue from the pellet gun barrel. With an estimated 3.2 million air guns purchased annually in the United States, the media reports an increasing number of incidents involving air guns. Approximately 50% of these air guns have a muzzle velocity between 500 and 930 fps. Air guns with these muzzle velocities in this range have the potential to cause tissue damage and in some cases serious injuries or death. Understanding pellet wipe patterns can assist investigators in analyzing and reconstructing events in accidental or intentional pellet gun discharges. Investigators can evaluate the pellet wipe pattern to determine if the pattern is consistent with other physical crime scene evidence and statements from witnesses.

A study was conducted to evaluate the consistency of pellet wipe patterns when pellets are fired perpendicular into fabric targets at a known distance. A Winchester model 600X air rifle was used to conduct the test on twenty-five fabric samples. The Winchester air rifle is a spring piston type air rifle with an overall length of 105 cm (41.5 in), barrel length 45 cm (17.7 in), and weight 2.7 kg (5.9 lbs). The air rifle manual reports the muzzle velocity at 600 fps with 6.2 ft lbs of muzzle energy. A chronograph was used to test the muzzle velocity based on 10 shots. The average velocity was 600 feet per second. The range of velocity was 595 to 605 feet per second. Ten fabric samples were 100% cotton fabric, nine were 100% polyester, and six were 70% wool and 30% nylon blend.

Pellets used in the study were .177 (4.5 mm) caliber Benjamin Sheridan domed diabolo styled lead pellets. The average pellet weight was 7.8 grains based on a sample of 20 pellets. The pellet weights ranged from 7.5 grains to 8.0 grains. Square cardboard targets approximately 11.43 cm by 11.43 cm (4.5 in x 4.5 in) in size and .64 cm (.25 in) thick were prepared and covered with fabric. The pellets were fired into the samples at a distance of 1.52 m (5 ft). One target covered in white fabric was used as a

standard for detecting a visible pellet wipe pattern. Digital infrared images were photographed with a 35 mm Nikon D-70 camera with an 18-70 mm f 3.5 – 4.5 G ED-IF AF – S DX Nikkor lens and a 67 mm #87 infrared Tiffen filter. The lens to object distance was 22.86 cm (9 in). The average exposure time was 8 seconds. Pellet wipe was visible in 22 (88%) of the twenty-five fabric samples. Of the 100% cotton samples, pellet wipe was visible in 7 out of 10 samples, and in the 100% polyester samples, pellet wipe was visible in 9 out of 10 samples. Pellet wipe was visible in all of the samples of the blends of 70% wool and 30% nylon. Recording a digital infrared image is an effective method to enhance pellet wipe patterns on dark and multi-colored fabrics. It does not alter the pellet wipe pattern and results are obtained right away. When infrared images fail to produce pellet wipe patterns, sodium rhodizonate, a chemically specific test for lead, can be used to test the margin for lead or lead alloyed particles around the pellet holes.

Pellet Wipe, Digital Infrared Image, Air Gun

D46 The Use of Liquid Latex to Remove Soot From Arson Scenes to Facilitate Further Forensic Examinations - A Case Study

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After attending this presentation attendees, particularly arson and major crime scene investigators will learn of the development, implementation, and use of a method to remove soot from arson scenes and exhibits. Removal of soot from such scenes and exhibits allows further examination to locate, enhance and recover fingerprints and the location of bloodstaining.

This presentation will impact the forensic community and/or humanity by providing a easy, fast, reliable, and cheap method to remove soot from arson scenes and exhibits to facilitate further forensic examinations, particularly the examination for fingerprint evidence and the recovery of DNA based evidence types. The effective removal of soot from arson scenes has been an on going problem to the forensic community, and the development of this technique has removed up to 90% of soot from surfaces within arson scenes and exhibits recovered from arson scenes.

In June 2005, a murder inquiry was commenced by the Metropolitan Police Service, Specialist Crime Directorate (SCD) following the discovery of the dismembered remains of a human body, floating in a canal in northwest London. Over 120 pieces of flesh were recovered from black plastic bin bags which were also found floating in the canal. The upper half of the deceased's torso was found in a shopping trolley type bag, wrapped in black plastic bin bags that had been tied with bicycle gear/break cables to a set of gymnasium weights. Approximately one week after the location of the body parts, the head of the deceased male was also found in the canal in a black plastic bin bag. The lower half of the deceased torso, arms, and legs were never located.

Investigations by detectives of the SCD led the investigative team to a 5th floor flat in a housing estate, near to the canal where the body parts were located. The flat had been the subject of an arson attack approximately two days prior to the location of the body parts. The flat was identified as being rented by a male, who was later arrested and considered a suspect in connection with this offence. The suspect made statements to the investigating police officers, stating that this flat was often used by persons known and unknown to him and that one of these people must have been responsible for any criminal activity that may have taken place in the flat.

The flat was examined and four seats of fire were determined. Blood was spattered on the living room doors and doorways, on a hallway cabinet and bloodstaining was also present on surfaces within the bathroom. Due to the statements made by the suspect, it was necessary to examine the crime scene for the presence of fingerprints.

Preliminary examinations for fingerprints on suitable surfaces were unsuccessful due to the levels of soot present which affected the location and identification of fingerprints. The soot also interfered with light source examinations due to the contamination of the surface.

A solution of liquid latex was applied to surfaces within a homicide scene to remove soot from surfaces to allow further fingerprint examinations. Once applied, the latex was allowed to dry and when peeled from the surfaces up to 90% of soot was removed. Numerous fingerprints were located within the address, some of which were identified to the suspect, the victim and to persons of interest in this case. Further chemical enhancement of fingerprints could also be undertaken and, in addition, further bloodstain pattern examinations could be undertaken.

The development of this technique has now been adopted within the Metropolitan Police Service to examine arson homicide scenes and also items recovered from arson scenes. Items submitted to the laboratory can be treated with liquid latex to remove soot and further fingerprint and DNA recovery examinations can be undertaken. Liquid latex does not affect subsequent light source and chemical enhancement techniques, nor does it affect DNA analysis. This is a cheap, fast, and very effective method for soot removal and in the author's opinion is an easier soot removal technique than the use of sodium hydroxide solutions.

This presentation will explain the use, application and effectiveness of this technique as used on criminal casework within the Metropolitan Police Service.

Soot, Liquid Latex, Fingerprint

D47 The Probabilities Associated With the Matching of Impression Evidence

David G. Howitt, PhD*, Forensic Science Graduate Group, University of California, Department of Chemical Engineering, Davis, CA 95616

The goal of this presentation is to provide a method to evaluate the statistical probability associated with an impression evidence match.

This presentation will impact the forensic science community by demonstrating a new approach to impression evidence matching.

The unique correspondence between two impression marks is something one hears about all the time but the reasoning behind this assertion is conspicuously absent in the literature and would seem to be a problem that is worth paying some attention to. Although the matching of impression evidence modified by irregular wear patterns or defects is certainly indicative of a unique history in the broad sense it doesn't automatically follow that what remains as evidence can be treated in the same way. The elimination of general features or class characteristics as a justification for unique correspondence is certainly a good first step and certainly the greater the number of matching features the more unlikely is the correspondence is due to chance however one is on dangerous ground if it is simply left as that. A good example of random marks is scratches and these can be overlaid onto a suspect pattern to reveal a match. The probabilities for this kind of pattern matching can be calculated based upon the detail that most people can resolve and so limits the possibilities of coincidence. This is equivalent to partitioning the scratches into component lines about 0.5 mm wide, which is the separation at which most people can distinguish line pairs and so when one is evaluating an array of scratches across a width w , either by eye or through a microscope, then the probability that we will find a particular line at a specific location in the

array is $P = \frac{r}{w}$. For an array in a half inch wide space for example the

chances of finding a line at a particular place is $P = \frac{r}{w} = \frac{0.05}{1.27} = 0.039$

meaning that in this case where there are 25 discernable line positions (w/r) on the pattern and any particular line that happens to be involved in a match to any other will be found in one of these locations.

The number of different ways that a sequence of n lines can be distributed over the w/r locations is given by $\omega_n = \frac{w/r!}{n!(w/r-n)!}$

since the number of ways that N objects can be arranged in j subsets is

$\omega = \frac{N!}{n_1!n_2!n_3!\dots n_j!}$ where $N = \sum_{i=1}^j n_i$ and for the case of 15

matching lines out of a pattern of 20, for example, when there are 25

discernable line positions $\omega = \frac{25!}{15!10!} = 3,268,760$ that is to say there

are over three million different ways to construct sets of 15 lines and the probability of finding any specific one of them is one in 3.3 million which seems pretty convincing. That is of course until one realizes that there are actually going to be 15,504 patterns of 15 lines on the subject evidence which reduces this probability to 1 in 210. The presence of 15 lines amongst 25 is another matter however if they happen to form an uninterrupted sequence because the probability for this occurrence is

$$P_c = \left(\frac{n!(w/r-n)!}{(w/r)!} \right)^2 \left(\frac{(w/r)!}{n!(w/r-n)!} - \frac{N_1!}{n!(N_1-n)!} + (N_1-n+1) \right) (N_2-n+1)$$

or 1 in half a million which is certainly less likely but still hardly unique. Had the pattern of scratches been spread over a 1 inch span rather than half an inch however the patterns would have been unique.

Probability, Evidence, Toolmarks

D48 The Quantification and Time Effects of Bruises Created Using a Drop Mass System

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The goal of this presentation is to educate attendees on the effects that mass and impact velocity have on the duration and color of bruises created on the forearms of volunteers.

The impact of this research to the forensic community lies in its ability to build a scientific basis for a bruise classification and a better understanding of bruising biomechanics. These findings will assist emergency room physicians in determining cases of possible physical abuse.

Existing literature contains conflicting information regarding the color changes in bruises with respect to time. There is general agreement that the first colors seen are usually deeper reds, black and blue. Yellow is generally not seen for the first 18-24 hours, but after that, any color may be present. It follows that deeper tissue bruises will remain darker, longer. It is hypothesized that a lighter, faster impactor will create a bruise that will begin to resolve more quickly and the colors will be lighter.

The relationship between mass, velocity and bruise characteristics has not been explored in any published literature. Specifically of interest is the affect that impact velocity has on bruise area and bruise color when the impact is controlled for constant impact energy. It is hypothesized that a faster lighter impactor will create a bruise with a larger surface area than a slower heavier impactor.

Preliminary data was collected using a drop mass system. Seven healthy adult volunteers age 23.3 +/- 3.2 years completed an initial questionnaire to screen for bleeding disorders and blood thinning medications. Informed consent was garnered and each subject had both forearms photographed (Canon EOS Digital Rebel XT, Lake Success, NY). Prior to impact, tri-stimulus light reflectance was also measured using a commercially available colorimeter (model CR-400, Konica Minolta, Mahwah, NJ.) Tri-stimulus light reflectance was reported using the three dimensional CIE 1976 (L*, a*, b*) color space, where L* represents

luminance (0 = black, 100 = white), a* represents the shift from magenta to green (green is indicated with negative values, red with positive values) and b* represents the shift from yellow to blue (blue is indicated with negative values, yellow with positive values).

The drop mass system was designed to deliver a constant 19.6 Joules of energy by dropping a steel mass down a PVC tube onto an impactor resting on the forearm of the subject. Two conditions were tested: low velocity, high mass and high velocity, and low mass. The low velocity, high mass consisted of a 2 kg mass being dropped from 1 meter resulting in a velocity of 4.4 m/s. The high velocity, low mass consisted of a 1 kg mass being dropped from a 2 meter height resulting in a velocity of 6.3 m/s. A load cell (model SPL 7187, Syscon Instruments Private Ltd., Bangalor, India) was placed under the volunteers' forearms to measure the amount of force transmitted through the forearm. Load data was collected at 10000 HZ using TDAS (Diversified Technical Systems, Seal Beach, Ca.) and displacement of the impactor was measured using high speed video at 1000 frames per second (model HG 100K, Redlake Inc., Tucson, AZ).

Volunteers were subjected to both impacts, one to each arm, based on randomization. Photographs were taken and light reflectance was measured immediately following the impacts and then every 24 hours for 96 hours. Each day, all three values of the tri-stimulus were recorded for both arms and compared to the pre-test values. Observation showed the forearms were visibly more red immediately following low velocity impact and this was confirmed by higher a* values for the low velocity impact between the pre-test and immediate post-test scans. Values at 72 and 96 hours for the a* values were significantly lower or more green (9.68 +/- 1.24, and 8.82 +/- 1.59 respectively) than the pre-test values (10.08 +/- 1.36) for the same arms (p<0.05). The initial increase in red comes from the inflammation response with the increase in green due to the metabolism of bilirubin, a metabolite of hemoglobin which is found when blood cells are lysed.

Table1 – a* values measured every 24 hours

Test Condition	Pre-test	0 hours	24 hours
Low Velocity	10.08 +/- 1.36	11.02+/-1.05	10.04 +/-1.25
High Velocity	9.61+/-1.49	10.42+/-0.87	9.52+/-1.35
Test Condition	48 hours	72 hours	96 hours
Low Velocity	9.85+/-1.28	9.68+/-1.24†	8.82+/-1.59†
High Velocity	9.61+/-1.14	9.33+/-1.57	9.01+/-1.15

† Statistically significant compared to pre-test values (p<0.05)

Bruising, Contusion, Impact Velocity

D49 The Ball's in Your Court: Castration as a Form of Extreme Body Modification in America

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The goal of this presentation is to introduce the forensic community to the world of extreme body modification (EBM), specifically castration, through several case studies.

The presentation will impact the forensic community by providing awareness that an illegal castration attempt may be the possible cause of a patient reporting to medical personnel with bleeding in the groin region.

Every forensic scientist should have at least one out of the ordinary, memorable case. In February 1999, such a case was brought into the Indiana State Police Crime Laboratory serology section in Fort Wayne, IN. This case introduced the unusual world of extreme body modification (EBM). The case involved a man, Edward Bodkin, who was arrested for castrating numerous men in Huntington, Indiana. Bodkin was brought to the attention of police by an ex-roommate, who reported that Edward was

performing the castrations on willing men in the kitchen of his apartment. A search of Edward's home yielded 9 glass jars containing what appeared to be human tissue found next to his refrigerator. Knives, other instruments and video tapes of the procedures were also collected. Forensic examination later confirmed that the jars did in fact contain human testicles. A trial was averted when Edward Bodkin admitted to "surgical procedures" – practicing medicine without a license.

This case seemed to be an isolated incident until a case in Michigan made the news several years later. In August 2002, a 29-year-old man was arrested for performing a castration on a 48-year-old "willing victim." A pair of severed testicles was found in a plastic storage container in the suspect's refrigerator. The similarities with the Bodkin case made it appear that this procedure was more common than originally thought. One year later, another castration case came to light in Pennsylvania. Since that time, illegal castrations continue to make the news. While none of the participants in these procedures have died, there has been excessive bleeding and injury.

Cursory knowledge of this EBM subculture will enable forensic experts to be more aware of it when it crosses their area of expertise. For example, unusual injuries on a victim may not be the result of attack, but may in fact be a voluntary modification.

A search on the internet has found an entire network of people who alter their bodies for many different reasons. From the simple tattoos and piercings to the removal of body parts, the world of EBM can present itself in many forms. Who are the willing participants in the castration procedure? What makes them want to remove that particular body part? Why would someone risk imprisonment to perform this medical procedure in their kitchen? Why would someone video tape the "surgery?" This paper will discuss these issues as well as delve into the strange world of EBM on the Internet.

Castration, Extreme Body Modification, Internet

D50 Mass Graves as a Waste Disposal Solution?

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After attending this presentation, attendees will understand the nature of the dilemma faced by the UK Government regarding the preparation for and anticipation of a national influenza pandemic. Such a scenario could create "excess deaths" that would exceed the capabilities of existing burial, cremation, and funeral facilities. The use of mass graves in different contexts will be examined, with special reference to their value as a modern "waste" disposal solution. They will be compared to animal burial sites used for control of the spread of disease as an analogue for human "collective" burials in a pandemic situation. Participants will be able to understand the impact of such graves on the environment, in terms of landscape issues, alteration of vegetation, and any chemical and biological interactions between the infill and the surroundings. In addition, they will be able to recognize the social and economic effects of such graves on the local and wider communities.

This research brings together three significant and timely themes increasingly relevant in the UK today. Mass fatality incidents and environmental issues are at the forefront of the Government's agenda. This presentation will impact the forensic science community by addressing the potential impact of mass graves on the environment, and is unique in its approach from the joint perspectives of forensic and environmental science. This research examines the options open to the United Kingdom government if it is faced with "excess deaths" caused by a national pandemic, and evaluates the most effective disposal methods available. It takes into consideration the effect that such collective burials may have on the environment, economy and social framework of communities. It will

demonstrate how the Government is being pro-active in addressing environmental issues, and how well the United Kingdom's unique spatial and geographical circumstances are being tackled. It is hoped that the results of this research could inform and influence Home Office policy on the most environmentally, socially and economically efficient method of mass body disposal.

In light of the increasing threat of an avian flu pandemic in the UK, the Home Office have been investigating a range of methods for managing the potential problem of excess deaths that could exceed the capabilities of existing burial and funeral facilities.^(1,2) There is currently unprecedented pressure on the Government to find an environmentally, ethically, socially and economically sound solution to the problem of disposal of bodies.

This paper aims to examine the nature of the problem faced by the government, and assess the value of mass graves as a modern 'waste' disposal solution. This study will investigate the possible alternatives to mass graves, such as cremation and individual burials, in response to pandemic situations. It will also evaluate and compare mass graves to landfill sites and the mass animal burial sites typified by the Foot and Mouth Crisis of 2001-02, with reference to minimizing the impact on the environment. This research will lead the way for further development of a twenty-first century 'waste' disposal solution model for the United Kingdom's specific geographical and spatial dilemma; as well as demonstrating the government's commitment to finding solutions whilst incorporating environmental 'best practice' as a key driver.

References:

- 1 Stones, A (2006) 'Mass Graves Planned if Bird Flu Pandemic Reaches Britain', www.telegraph.co.uk.
- 2 Cabinet Office (2006) 'Contingency Planning for A Possible Influenza Pandemic: Version 2', www.preparingforemergencies.gov.uk/emergency/.

Mass Graves, Waste Disposal, Environment

D51 A Better Mouse Trap: A New Technique for the Collection, Preservation, and Examination of Trace Evidence

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Upon completion of this workshop, participants will learn a new method of finding, collecting, preserving, and examining trace evidence using an inexpensive gripping material that is readily available in any local supermarket. Participants will further discover that the use of this gripping material for trace evidence recovery include easy examination options without having to disturb collected evidence; superior gripping ability and ease in handling lifts that include better resiliency and contort-ability; greater collection of materials that may often go undetected; and easy storage of the lifts and little or no damage to the evidence itself.

This new trace evidence collection technique will reduce many of the obstacles faced by investigators in the intricate task of collecting and examining trace evidence. Therefore this presentation will have a substantial impact on both the forensic science community and on jurisprudence as it allows crime scene investigators not only a better way to collect evidence, but it also permits better preservation and examination of the evidence without necessarily having to remove, damage or alter evidence from the collected surface. This in turn will increase the validity, understanding and use of trace evidence presented at trials. Evidence that can be preserved may then be made available for defense experts to examine and for juries to personally view during pertinent testimony. Also, preserved trace evidence lifts that can remain intact on a collected surface and still examined under a microscope and/or by using common digital computer software such as Adobe Photoshop® will permit more sensitive

and through examination of recovered trace evidence and provide a time-saving tool for backlogged laboratory examiners.

Trace evidence often consists of very small quantities and/or may be very small in physical size and may be easily overlooked for a number of reasons, including human error, distractions and/or adverse conditions at the crime scene, one or all of which may lead to leaving behind extremely valuable crime scene evidence. This may be particularly true in cases where investigators cannot remain at the scene as long as necessary to complete a thorough search for evidence if for example there are structural or chemical hazards, inclement weather or where there is on-going violence. The already difficult task of finding trace evidence may also be hindered when investigators are processing crime scenes that have dark colored floors, plush carpeting or patterned areas with very busy backgrounds, surfaces that make evidence recovery much harder, particularly on the human eye. This technique not only permits recovery of trace evidence on surfaces such as tiles, carpets, rugs and floors, but it also permits successful recovery on such odd, uneven, textured or irregularly contoured surfaces as loose dirt, stuffed animals, soles of shoes. It may even be employed to successfully remove evidence from paper without tearing it. The technique is nearly identical to that which is used to tape lift fingerprints. Thus, a well trained and experienced investigator does not need to undergo additional training to use this technique, or the material, at crime scenes; it is more a matter of practice.

Trace, Collection, Evidence

D52 Photographic Differences Between the Colposcope and SLR Digital Camera With a RAW File

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The goals of this presentation are to list several qualities of a good picture, define and visualize depth of field between a colposcope and a digital camera SLR, and visualize the difference between similar pictures and resolution of the pictures.

The presentation will impact the forensic science community by demonstrating how forensic photography for the sexual assault examiner includes body pictures as well as pictures of the genital area looking for injury, no injury or evidence of pre-existing medical conditions.

Forensic photography for the sexual assault examiner includes body pictures as well as pictures of the genital area looking for injury, no injury or evidence of pre-existing medical conditions.

In the past, one of the tools that the sexual assault examiner has used has been the colposcope. Today the trend is moving toward digital photography. Common facts about digital picture quality that most people will agree on are that the picture:

- be in focus
- not to light or too dark
- aligned and not twisted
- represent the subject matter
- not be compressed too much
- has enough image resolution

3D can be defined as giving the illusion of depth. "Depth of Field" in a picture is the distance range in front of and behind the center spot in the picture. As an example, if close up picture displays the center area "in focus" and the outer areas out of focus, the picture has a limited depth of field.

Magnification plays a major role in determining the size of this depth of field range. Generally, the higher the magnification, the lower the depth of field. Using a colposcope, the ocular lens must be adjusted in order to see clearly the separate areas of focus.

This presentation will compare the depth of field, clarity, and all the picture facts for quality of a good photo between a picture taken using a colposcope and a digital camera. Several images similar in subject matter will be displayed for visualization of the difference in resolution and quality of picture. The participant will be able to observe and compare these different technologies and apply the information to their own sexual assault practice.

Many concerns about using digital pictures in court room are often expressed as well, not only by health care professionals but district attorneys. Additionally, the court of law may not be comfortable with secure digital imaging or have concerns that the pictures were not altered or changed.

Digital x-rays, digital sonograms and digital ultrasounds are used every day to make life and death medical decisions in every part of the country and it has been that way for years. These “digital pictures” have been used as legal evidence in medical suits and other such legal cases. That means that the standards for “digital” in the courtroom have already been set.

U.S. Federal Customs Agents capture digital headshot pictures, digital fingerprint pictures, and digital retina scans everyday at every border crossing today. These digital pictures are used to track and identify people, and legally deny undesirables into the county. The U.S. customs agents that interview citizens as they re-enter the country all have digital cameras and fingerprint scanners right at their desks.

This presentation will help the participant review and provide concrete examples for using digital pictures at your hospital or programs. Communication and education of the community will be an important first step to understanding what digital photography can do for evidence that can be brought to a court of law.

Forensic Photography, Colposcope, Sexual Assault/Child Abuse

D53 Gunshot Wounds in Police vs. Civilian Homicides: Analysis of Entrance, Trajectory, and Numbers

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After attending this presentation, attendees will be able to distinguish the pattern of injuries from police shootings versus civilian shootings. The goal of our study is to aid future crime scene investigations in distinguishing between justifiable homicide in the line of duty and criminal homicide.

The information provided by this study may impact the forensic science community by potentially helping to establish the position of the shooter in relation to the victim or the activity of the victim in controversial homicides involving police. Furthermore, the compilation of this data may prove useful as feedback information in the training of law enforcement officials.

Police or officer involved shootings (OIS) are a frequent part of containing a difficult and volatile situation, which may result in a homicidal death of a civilian or even law enforcement personnel. Frequently, the police respond to calls involving an armed individual and multiple shots may be fired. The manner of death in these cases is classified as homicide with the distinction of criminal homicide in cases involving only civilians or justifiable homicide in cases of police officers as the shooter acting in an appropriate manner.

Proper crime scene investigation as well as careful forensic post-mortem examination is necessary to establish the number of shooters, numbers of shots fired, the type of ammunition used, the cause of death, the extent of injury to the decedent, characterization of the gunshot wounds as well as the position of the shooter in relation to the victim. Currently, no

research has been published which evaluates the difference in these variables between police and civilian shooters.

In the last five years, the Medical Examiner's Office of the City of St. Louis, Missouri has compiled over 500 cases of homicides from gunshots, some of which have involved police as the shooters. The study retrospectively analyzes homicides involving police officers versus civilian only homicides in relation to the number of shots fired, where the entrance wounds are located on the body (i.e., posterior, extremities, etc), and the bullet trajectory. Attempts were made to closely match the victims by age, sex, and race. In addition to recording demographic information, the victims will be divided into 2 categories: (A) officer involved shootings, and (B) civilian homicide. In each case, the following variables will be collected: (1) the number of entrance wounds, (2) the location of the entrance wounds, (3) the trajectory of the shots, (4) the type of ammunition used, and (5) the range of shot as characterized by the appearance of the gunshot entrance wound.

The hypothesis is that the officer involved shootings have fewer entrance wounds overall and thereby the gunshot wounds at the hands of law enforcement, although fewer in number, involve predictably lethal parts of the body such as the chest or head. In addition, it was found that gunshot entrance wounds in officer involved shootings are more often found on the anterior aspect of the body as most “face-off” situations—including “suicide by cop”—place the police officer in direct confrontation with the offender. In the cases of civilian only homicides, higher numbers of gunshot entrance wounds located on the posterior or lateral portions of the body and higher numbers of gunshot wounds that are not life threatening compared to homicides involving the police were found.

Officer Involved Shooting (OIS), Homicide, Gunshot Wound

D54 Analysis and Characterization of Children's Latent Fingerprint Residues by Infrared Microspectrometry and Gas Chromatography/Mass Spectrometry

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Upon completion of this presentation, attendees will understand the chemical changes that occur in children's latent fingerprints as a function of time and temperature.

The presentation will impact the forensic science community by demonstrating how an understanding of the chemical changes that occur in children's latent fingerprints over time may lead to improved methods for collection of children's fingerprints from crime scene investigations.

Latent fingerprint residues from pre-pubescent children have been observed to disappear from crime scenes faster than those of adults. Therefore, a study was initiated to determine the chemistry of children's skin surface residues. Latent fingerprint residues were collected from fifty-seven children, ranging in age from one to eleven years. The fingerprints were deposited onto aluminum-coated glass slides and analyzed by infrared microspectrometry. The data suggest that there are three consistent classes of compounds present in the latent fingerprint residues of pre-pubescent children: protein, esters, and carboxylic acid salts. While a spectrum of pure squalene was not obtained, an unsaturation peak at approximately 3100 cm⁻¹ was routinely observed in many of the latent fingerprint residues and is attributed to the presence of squalene in the residues. The time study, discussed below, was initiated to further understand the changes in the chemical composition of the fingerprint residues as a function of time.

To determine the stability of the compounds over time, data were collected every twenty-four hours, using the same experimental parameters, over a period of ninety-six hours. The percent change in the

absorbance of both the salts and esters was recorded. The results suggest that the esters disappear more rapidly from the fingerprint residues of children relative to the salts. After a period of ninety-six hours, the percent change in the absorbance of the esters was approximately ninety-five while the percent change in the absorbance of the salts was approximately five. These results suggest that children's latent fingerprints have been historically difficult to recover because the salts were not being targeted by the developing agents. Additional analysis of the infrared data revealed that the unsaturation peak that was consistently observed at approximately 3100 cm^{-1} disappeared from all spectra after approximately two weeks while a second carbonyl peak appeared. These results are indicative of squalene oxidation and mass spectrometric analysis will be performed to confirm this supposition.

To further characterize the changes that occurred in the latent fingerprints as a function of time, gas chromatography with mass spectrometry experiments are currently being performed. The latent fingerprint residues that were collected on the glass slides will be extracted and analyzed to gain a better understanding of the complex chemical changes that were observed from studying the residues by infrared analysis. The mass spectrometry data will be discussed in the context of the chemical changes that occurred in the latent fingerprint residues after the residues were kept at ambient temperature for a period of more than four years. After completion of the mass spectrometry experiments, the data will be analyzed to gain a better understanding of the compounds that remain in children's fingerprint residues over extended time periods. The ultimate goal is to develop a better method of targeting the specific compounds in children's latent fingerprint residues so that the fingerprints can be recovered in crime scene investigations.

Latent Fingerprints, Infrared Microspectrometry, Gas Chromatography/Mass Spectrometry

D55 Gunshot Suicides in the Island of Crete

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The primary goal of this study is to present the characteristics of gunshot suicides in the region of Crete between January 1999 and December 2006.

This presentation will impact the forensic community and/or humanity by raising awareness and evoking interest to the serious health and community burden represented by gunshot suicides.

Data was collected from the records of the Department of Forensic Sciences, Faculty of Medicine, University of Crete. Furthermore, data was cross-checked with the records kept in the Police Departments as well as the Public Prosecutor orders per case in each prefecture. Any discrepancy was discussed with the Head of the Department of Forensic Sciences.

Crete lays in the Mediterranean Sea, is geographically isolated from the Greek mainland and constitutes the southernmost part of Greece with approximately 600,000 inhabitants. The island of Crete has been inhabited since prehistoric times. Nowadays, it is no secret that in the notoriously trigger-happy island most Cretans, by tradition, own guns. Road signs are easy targets and you will see many of them that resemble swiss cheese after some shooting practice.

Gunshot suicides were reviewed in the island of Crete for a eight year period (1999-2006) with respect to age, sex, type of firearm, anatomical location of the entrance wound, alcohol use, location of the event, and the presence of a suicide note. In the present study, which is the first relative study for a part of the Greek population, comparison was made with

available data from a nationwide study of suicide (data period 1980-1995) and from the Epirus region, South-West Greece (data period 1998-2002). There were a total of 323 suicides during the period 1999-2006 in Crete. 19.5% of all suicide cases ($n=63$) used firearms, the third most frequent used method in the island, while the second favored method nationwide and in Epirus region. In contrast, firearm related suicides were the most common mode of suicide in the United States with a percentage of 60.9, between 1990 and 1995 years. When compared with European countries, firearm usage makes up 21.2% of the suicides in Finland, 24.7% in France, 10.4% in Germany, 18.3% in Austria, and 28.9% in Norway. Firearm suicides were more common in males and their frequency decreased as age increased, though is the less common means for women ($n=1$). In the majority of cases the suicide victims used shotguns (hunting rifles) and the shooting distance was contact or near contact. Most of the entrance wounds were located in the head and chest region. The number of gunshot suicide victims leaving a suicide note in this study is consistent with the observation that the majority of all suicide victims fail to leave such a note. With respect to the location of the event, the majority of gunshot suicide victims preferred to commit suicide in familiar surroundings, particularly the home or adjoining property. These findings are in accordance with other countries.

In Greece according to the national law 2168/1993 firearm acquisition requires the purchaser to obtain a firearm acquisition license. In order to obtain such a license, the applicant must be 18 years or older, have not been convicted of a crime in the last five years, to have a medical certificate of good mental health (provided from a psychiatrist, neurologist, or pathologist in a state hospital), and wait approximately a month before purchase. According to the Greek authorities there are more than million-and-a-half illegal guns in the country and they estimate that some 600,000 are in the island of Crete, the largest center of the arms trade in Greece. It is well known that availability of means to commit suicide has a major impact on actual suicides in any region; nevertheless Cretans seem to have a discreet gun culture. Despite the convenience to possess a firearm-legally or not-, gunshot suicides makes up in Crete a less common used mode compared with available data from a nationwide study of suicide and from the Epirus region, South-West Greece.

Suicide, Gunshot, Crete

D56 Homicide or Suicide? Unusual Death of Man Suspected of Sexual Harassment in Family Context

Antonina Argo, Annalisa Salerno, Filippo Maria Cascino, and Paolo Procaccianti, Palermo University, Via Del Vespro 127, P, Palermo, 0 90100, ITALY*

The goal of this presentation is to describe the shame and the social stigma related with pedophilia and how it led a man to suicide by fire.

This presentation will describe a particular case of a carbonized corpse, found in his burnt-out car in an isolated Palermo's west suburban zone.

The external examination revealed burns of IV degree, "pugilistic attitude", "partly-cooked" muscle, brittle greyish-white splinters bone, loss of skeletal structures, and the absence of hands, limbs and feet. The radiological findings, made before the dissection, excluded the presence in the body of bullets or metallic splinters. Autopsy findings showed the presence of soot in trachea mucus, partial cooked viscera, the presence of fluid blood in the cardiac chambers, of urine in urinary bladder and the absence of marks of cranial and neck trauma.

Biological samples were used for toxicological analyses that showed high level of carboxyhemoglobin.

The DNA analysis on blood spot samples, compared with daughter's blood sample, showed that the body was a 64-year-old Caucasian male, gone away, alone and spontaneously, eight hours before his finding after a

quarrel in which he was accused of not verified sexual harassments in family context. Circumstantial data evidenced that he expressed the will to commit suicide.

According to the autopsy finding, toxicological results, and circumstantial data, suicide was presumed as the cause of death for this man, without pre-existent psychiatric pathologies, in which shame and the social stigma related with pedophilia led him to suicide by fire self-burning.

Suicide, Self-Burning, Sexual Harassment

D57 A Particular Case of Suicide Committed With a Double-Barreled Shotgun

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The goal of this presentation is to illustrate a particular case of suicide of a 17-year-old Caucasian boy, who was found dead on the floor of his bedroom with a large shotgun contact wound on his head.

The weapon at the scene used for committing the suicide was a shotgun, calibre 12 mm, regularly used by his father. This weapon was fixed with electrical tape on two perpendicular planks, which were laying on the floor near the head of the boy. On the vertical plank, a hand drill with a screwdriver was fixed. The body was in a supine position, a motorcycle helmet strap was found on his neck, and a small electronic box was in his right hand.

This box was connected to the hand drill by a small electric cable that passed over the trigger of the gun. The gun barrel was fastened to the strap of the motorcycle helmet by electrical tape and rested against his right temple.

At the external examination, there were devastating injuries with large gaping tears of the scalp and ejection of brain tissue; no other injuries were found.

Near the body, fragments of skull, brain tissue, and of motorcycle helmet were found, and near the left part of his trunk, there was a sheet of paper in which was written “*donate my organs*”. Blood stains and fragments of brain tissue were found on the walls. There were no drugs in the room. On his writing desk numerous drawings representing violence scenes between father and son were found.

The legal authorities decided to not perform the autopsy, because the cause of death was evident. This particular case shows a serious and deep depression of a boy and the difficult father-child relationship.

Juvenile Suicide, Shotgun Contact Wound, Suicide

D58 Strangulation in Sexual Assault: A Case Study

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After attending this presentation, attendees will recognize physical indicators of strangulation in the course of sexual assault, methods of documentation, and barriers to evidence collection and prosecution.

This presentation will impact the forensic community by highlighting the need for multiple forms of documentation of strangulation in sexual assault for best victim and investigation outcomes.

Strangulation is frequently used as a means of power and control in sexual assault. Obstruction of the airway and major vessels of the neck may lead to disorientation, unconsciousness or death of the victim. After an incident of strangulation the victim may be unable to clearly articulate the events which took place during the attack, describing symptoms such as headache, hoarseness, vomiting, a perception of throat swelling or

closure, and shortness of breath. In addition, perceptions of symptoms may also be altered by ingestion of alcohol or drugs. Although a ligature or other device can be used the most common form of strangulation occurs with the hand or forearm. Symptoms result from a combination of how much force the attacker applies, the location on the neck and the surface area over which the force is applied as well as the amount of the applied force. Strangulation can result in no visible injury or may produce hematomas and abrasions of the neck, petechiae of the conjunctiva, skin surface, and mucous membranes, and subconjunctival hemorrhage of the eyes. The amount of time that passes between the assault and the forensic examination can make a difference in being able to document visible injuries.

In April of 2007 a 29 year old female reported being strangled during the course of an attempted sexual assault to the San Diego Sheriff's Office in Encinitas, California. The victim, who had been out drinking with a friend, was attacked at her vehicle where the assailant strangled and beat her, resulting in multiple trauma and vomiting. Prior to the forensic examination the patient was taken to a local Emergency Department where she was medicated with Ativan, treated for her injuries, and a laceration below her eye was sutured. She was then transferred by the Sheriff's Department to Pomerado Hospital in Poway, California for a forensic evidentiary examination.

During the course of the forensic interview the victim stated that penile-vaginal penetration had occurred and that the assailant used his hands to grab her throat. While holding her by the throat he shook her by the neck and told her he could kill her. The victim denied loss of consciousness and thought she may have had some memory loss but here memory was returning post-assault. During the course of the investigation it was learned that the suspect was in the United States illegally, spoke little or no English, and was a previously deported felon.

Documentation of the victim's injuries was performed with a digital 35 mm camera, a colposcope, and written documentation on the California Office of Emergency services from 923. Hematomas were noted to the neck bilaterally, as well as multiple bruises to the upper back, both arms right leg, and face. Black debris was found intra-vaginally.

This presentation will show the multiple documentation techniques employed in this investigation and discuss the challenges in a forensic examination of strangulation in sexual assault.

Strangulation, Sexual Assault, Forensic Examination

D59 Case Report of an Unusual Gunshot Suicide Inside a Grave

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The primary goal of this study is to present the case of a 66-year-old man who was found dead inside a grave with two gunshot wounds to the head. The results of the scene investigation, the ammunition used, and the autopsy and toxicological findings are described.

This presentation will impact the forensic community by presenting a case of an unusual location of a suicide event as there is no mention of gunshot suicide in a grave in the English-language literature. The majority of gunshot suicide victims prefer to commit suicide in familiar settings with privacy, particularly in the house or adjoining property.

Data was collected from the records of the Department of Forensic Sciences, Faculty of Medicine, University of Crete.

In September 2003, a 66-year-old man, recently retired, visited his village, approximately 42km from the city of Chania, as he would do normally. He had a telephone conversation with his children and a second one with his wife, who was on vacation outside the country. The next day none of the family had seen him. He was reported missing by his son as he recently had suffered a cerebral stroke and a huge search started immediately. The next day, police investigators found his body inside a grave that has been recently purchased by the victim. While entering the village cemetery everything looked normal and the grave slabs were in position except one that seemed slightly moved. Investigators then decided to move the grave's slab and have a closer look inside. The 66-year-old man was found sitting on a cement parapet; his left shoulder was lying on the inner side while having a 9-mm Luger pistol still in his right hand. The scene investigation showed no evidence of a struggle. In the interior, investigators found: (1) three fired cartridges (the two in the victim's feet), (2) two live cartridges in the chamber, (3) one live cartridge in the clip and another one out, (4) fourteen live cartridges in a paper bag, (5) a knife 28cm in length, (6) a hand lens and a battery, (7) two pairs of glasses, (8) a rubber cement tin and four silicone tubes, and (9) a metal device used for the silicone. The deceased had apparently used the silicone to seal the grave's slabs from inside before committing suicide. A multiple page suicide note was found in a knapsack in the victim's car trunk, parked outside his home, while a second one was found inside the grave.

Autopsy examination revealed two typical contact gunshot entrance wounds in the head. The first entrance wound was located in the right temple and the exit wound in the left parietal. The course of the bullet was right to left. The second entrance wound was located in the middle line of palate inside the mouth with upper jaw and mandible smashed. The course of the bullet was upward. One deformed bullet was found smashed in the fractured left zygomatic bone parts and beneath the skin. Gunpowder residues were detected in the right hand in the subsequent chemical detection in Crime Lab. Toxicological analysis showed a 0 g/l blood alcohol and it was also negative for other drugs.

Multiple contact suicidal gunshot wounds to the head have been not at all unusual in the every day medicolegal practice. Nevertheless, it is important to keep in mind that scene investigation, including the position of the body and gun, the pattern of blood splatter, past history of the victim, questioning of the members of the household, and the existence of a suicide note, is evident of suicidal intent or not in the medicolegal investigation.

Gunshot Wound, Suicide, Crete

D60 Human Trafficking: Implications for Forensic Nursing Practice

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The goals of this presentation are to (1) describe types of injuries and illness that trafficking victims often acquire, (2) identify forensic evidence that could be gathered by the forensic nurse to aid in the investigation of crimes of human trafficking, and (3) discuss implications for forensic nursing practice concerning detection, intervention and prevention of this violent crime against humanity.

The presentation will impact the forensic science community by demonstrating how "trafficking in persons" is a crime against humanity and an act of modern day slavery.

Approximately 900,000 persons are trafficked around the world every year and it is estimated that half of these victims are children. Following the illicit drug trade, trafficking in persons is tied with firearms trafficking as the second most lucrative business among organized crime groups. Unlike drug and firearms trafficking, however, human traffickers can continue to exploit their victims long after the initial point of sale.

Victims may be hidden underground as laborers or servants while others are sold into the sex trade. Through the use of force, fraud or coercion victims are often beaten, tortured, raped, or drugged into

compliance. To their captors, trafficked persons are commodities whose value diminishes when they become injured or sick. Victims overcome by illness or injury may be escorted by their captors or a designee to seek treatment at healthcare facilities. The forensic nurse may be the trafficking victim's first point of contact in the healthcare system. Through comprehensive nursing assessment, forensic nurses may detect evidence that points to the crime of human trafficking. Musculoskeletal injuries, patterns of injuries in various stages of healing, sexually transmitted infections, HIV/AIDS, malnutrition, and drug addiction are common health problems often acquired by trafficking victims.

Similar to the profile of a domestic violence victim, persons who have been trafficked live in fear of being further harmed or have been threatened that their loved ones would be killed if they were to report their situation to anyone. Victims feel that they cannot trust anyone and will be reluctant to disclose information about where they live or what has happened to them. Bio-psycho-social needs of the trafficked are like those of domestic violence victims in that they require a plan for safety, shelter, health care, mental health services and legal assistance.

Victims who have been trafficked from foreign countries fear that they will be arrested, incarcerated or deported by immigration authorities. For some, returning to their country of origin may be more dangerous than if they remained with traffickers. Personal documents such as birth certificates, passports, insurance information are likely not in possession of victims because they have been confiscated or destroyed by the traffickers. Sometimes victims are issued false documents.

Forensic nurses must be aware of the crime of human trafficking and have knowledge of laws, protocols for reporting, and resources for referring victims in the venues where they practice. This presentation will provide the audience with awareness of the prevalence of human trafficking, describe types of injuries and illness that trafficking victims often acquire, identify forensic evidence that could be gathered by the forensic nurse to aid in the investigation of crimes of human trafficking and discuss implications for forensic nursing practice concerning detection, intervention and prevention of this violent crime against humanity.

Human Trafficking, Forensic Nursing, Evidence

D61 Hymen Injury in Elderly Consensual Partners

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The goals of this presentation are to (1) review the physiology of the genitalia of the post-menopausal female, (2) present a case study of a 65-year-old female following consensual intercourse, and (3) to discuss the implications for complaints of rape in elder victims.

Injury to the female vulva and hymen has historically been the capstone for validation of rape. This presentation will impact the forensic science community by demonstrating how a case where there was injury following consensual intercourse has implications for the investigation of rape.

Injury to the female vulva and hymen has historically been the capstone for validation of sexual assault. This presentation is a case study that reviews the physiology of aging and the effect on male and female genitalia. The case is a 65-year-old Caucasian female who finds "new love" after the death of her husband of 40 years. She had not had any type of intercourse for over 10 years, due to the husband's illness. The 70-year-old partner used a lubricated condom. The client reported foreplay that included digital stimulation only. The patient reported that there was some "burning" upon penetration, but the pain diminished with continued activity. The next morning, the patient complained of pain and appeared at the clinic where permission was secured to photograph and present for educational purposes.

Rape, Sexual Assault, Elder

D62 Evidence Collection for Suspect Examinations

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The goals of this presentation are to name two basic items that are collected in a suspect examination for evidence, (2) list two examples of potential evidence collection in a suspect examination, and (3) state two barriers in obtaining suspect examination.

It is not uncommon to see sexual assault cases in which evidence is only collected from the victim. Hazelwood, (2001). There are three crime scenes in a sexual assault: the victim, location, and the suspect. Evidence should be collected from all scenes. Too often the suspect crime scene is often overlooked. Frequently there are no standardized procedures or protocols that deal with suspect examinations. The suspect examination may even be the best source of probative evidence in the case. These are the barriers that many communities face. This presentation will impact the forensic science community by reviewing basic examine and documentation components as well as providing key points and recommendations for suspect examinations.

It is not uncommon to see sexual assault cases in which evidence is only collected from the victim (Hazelwood, 2001). There are three crime scenes in a sexual assault. They are victim, location, and the suspect. Evidence should be collected from all scenes.

One source of evidence that is critically important but all too often overlooked in a sexual assault investigation is the suspect examination. Most sexual assault teams, or law enforcement agencies have failed to establish appropriate policies and procedures for obtaining comprehensive forensic examinations for sexual assault suspects which is unfortunate, given the potential for recovering probative evidence from the body as well as the clothing of suspects (Archambault, 2007).

The purpose of this presentation is to make the case for the importance of suspect examinations, to explore some of the reasons why they often are not done, and to provide concrete recommendations for overcoming these barriers and using suspect examinations effectively in your community.

When evaluating potential sources of evidence, the focus is anything that might have transferred from the alleged suspect to the victim; thus, forensic examinations of the victim are seen as critically important. However, keep in mind that any evidence that could potentially be transferred from the suspect to the victim may also be transferred from the victim to the suspect. Therefore, depending on the type of contact involved in a sexual assault offense, the suspect's body may actually be a better source of probative evidence than the victim's.

For example, in the case of a digital penetration of the victim's vagina, the suspect's fingers will often be the best source of probative evidence.

Results of suspect kits analyzed SDPD revealed the following:

- In cases involving an adolescent victim, 44% of the suspect's rape kits that were examined by a criminalist identified the victim's DNA. In fact, DNA analysis of epithelial cells found on penile swabs of the known suspect were the most common pieces of suspect evidence associated with victim identification.
- In the cases with an adult victim, as many as 30% of the suspect's rape kits that were examined by a criminalist identified the victim's DNA. Again, DNA analysis of epithelial cells found on penile swabs of the known suspect were the most common pieces of suspect evidence associated with victim identification.

Even beyond DNA evidence, the suspect examination is important because it can provide documentation of the suspect's clothing, appearance (e.g., shaven or unshaven), and other characteristics that may become important later on during the course of an investigation and prosecution.

Clearly, the decision to obtain a suspect examination should not be based solely on an understanding of how long trace and biological evidence might be available on the suspect's body. Recommendations for a forensic

examination of the suspect should be conducted any time (1) the suspect is arrested shortly after the sexual assault, (2) the law enforcement investigator believes that the suspect has not bathed since the sexual assault (however, keep in mind that depending on the type of assault, an exam may still be warranted even if the suspect has bathed), or (3) if there is reason to believe there might still be evidence of injury to the suspect.

Barriers to suspect exams:

1. Communities fail to see the importance of suspect examines.
 2. No established protocols
 3. Untrained, examiners.
 4. Funding for payment of these examinations.
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Sexual Assault, Suspect Examinations, Evidence Collection

D63 Evaluation of Fatal Sexual Violence Against Women: Collaboration Between Forensic Clinical Nurse Specialist and Body Donation Program

Sharon R. Crowley, RN, MN, 122 Emeline Avenue, Santa Cruz, CA 95060; and Charlotte A. Wacker, MS, University of California, Davis, Donated Body Program, 4800 Broadway, Suite 100, Sacramento, CA 95820*

The goals of this presentation are to (1) describe the forensic research partnership between a body donation program and a Forensic Clinical Nurse Specialist, via studies to provide a theoretical framework for the medical evaluation of fatal sexual violence, (2) describe the sample population of female cases from a body donation program, which serve as controls for the study of fatal sexual violence in women, and (3) describe a few of the myriad opportunities available to forensic scientists through collaboration with body donor programs.

This presentation will impact the forensic science community by (1) improving the diagnostic acumen of the forensic nurse examiners in postmortem anogenital examinations, (2) facilitating the development of a theoretical framework for medical evaluation of fatal sexual violence against women, and (3) facilitating knowledge and awareness within the forensic community of the capacity for future forensic research endeavors through donated body programs.

There are 112 whole body donation programs associated with medical schools or other academic entities, within the United States. In 2004, Wacker and Schmitt (AAFS, 2004) discussed both the traditional use of whole body donors, as well as the potential application to several areas of the forensic sciences. Traditional utilization of such donor specimens is found daily in medical education and research venues that incorporate surgical trials, biomechanical research, emergency procedures, and techniques for anatomic dissection (Wacker and Schmitt, AAFS, 2004).

The University of Tennessee, at Knoxville (UTK), is a well-recognized leader in forensic research. Every year, UTK utilizes approximately 50 human bodies for forensic anthropology studies (Wacker and Schmitt, AAFS, 2004). A non-exhaustive list of forensic professions with whole body donor application potential include anthropology, pathology, botany, entomology, and odontology. Now, that a successful liaison has been established, forensic nursing has been added to that list.

The Donated Body Program, at the University of California, at Davis, accepts donation of more than 100 bodies annually, for use in research and education, by individuals, and institutions. The stated goals of the Program in this regard are:

- Assist in education and continuing education of current and future health care practitioners, anatomists, forensic scientists, and mortuary technicians.
- Biomedical, forensic, and other scientific research that will assist in the development of procedures and/or products with general intent of improving the human condition." (Donated Body Program, UC Davis, CA, 12 February 2007).

In an effort to accumulate baseline cases for the study of the nature and appearance of the anogenital tissues during the postmortem interval, an IRB proposal was submitted and accepted by the University of California Davis Donated Body Program. Initial examinations on female cases commenced in March, 2007, and are ongoing.

In addition to contagious diseases, some of the general medical conditions that bar acceptance for medical study include obesity, extensive, metastasized cancers, diseases associated with muscular atrophy (e.g., muscular sclerosis), recent surgery, autopsy, traumatic injury, and certain diseases, e.g., arterial/vascular processes that impede either instruction of “normal” anatomy or specimen preservation.

Materials and Methods: This observational study is conducted on female whole body donors, ≥ 18 y.o. For this project, specimens are fresh, or fresh frozen, vs. embalmed. The majority of cases are received by the Sacramento County Coroner’s Office Morgue within 24 hours of death. Cases are tested for Hepatitis A, B, and HIV. Available, non-identifying demographic data is collected and cases for the current project are assigned a unique identifier for entry into a modified *Sexual Homicide Database* (Crowley, AAFS/1998; 2000; JFS/2004). Some of the variables include age, ethnicity/race, cause of death, date of death, interval from date of death to receipt by Program, concomitant medical processes, examination methods, photography, and examination adjuncts.

Crowley’s mobile system of technology for the examination of postmortem genital examinations with colposcopy is used on these baseline cases, which are examined at the Sacramento County Coroner’s Office Morgue (JFS, 2004). Eleven anatomic sites of the anogenital anatomy are routinely inspected and photographed. Comparison photographs are made with a digital single lens reflex (SLR) camera and a colposcope at 7.5, 15X magnification, or both. The genital examination also incorporates speculum insertion and anoscopy. In select cases, the 1% nuclear stain, toluidine blue, is applied and appropriately decolorized, in order to evaluate the efficacy of this adjunct as a tool in the postmortem examination.

In addition to the photographs from the SLR camera and the colposcope, a *postmortem worksheet* was developed to document the salient findings of the examination.

Discussion: Due to expertise with living sexual assault victims, forensic nurses and other experts are increasingly called upon to assist the forensic pathologist/medical examiner with the evaluation of select homicide cases to help determine concomitant sexual assault. The overall goal of this study project is to incorporate representative samples of natural, accidental, suicide, and non-sexual homicide. The Davis Donated Body Program provides excellent samples of natural death. One variable that may be unique to the Program sample is the greater age of the sample population thus far. In and of itself, this has been a valuable contribution. Traditionally, the number of reported postmenopausal living sexual assault victims has always been small, in comparison to younger victims. Thus, there has been a dearth of information about normal genital anatomy obtained via colposcopic examination of living victims in this age group. The opportunity to examine numerous cases of postmenopausal women that died a natural death is yielding extremely valuable data.

Whole body donors are received in a timely manner and appropriately stored in the coroner’s morgue, consistent with the standards for storage of human remains. The incorporation of cases from the Donated Body Program has provided an unprecedented opportunity to study both in great detail and in a timely manner, the nature and appearance of the anogenital tissues in the postmortem interval. Depending on concomitant medical and/or gynecological conditions, the anogenital tissues are in excellent condition and offer unparalleled opportunity to study early postmortem changes.

The generous donation of these individuals has afforded a needed research opportunity. On a larger scale, their gift has helped to provide a framework from which we can begin to understand the traumatic changes that occur in the aftermath of fatal sexual violence against women.

Fatal Female Sexual Violence, Body Donor Program, Forensic Clinical Nurse Specialist

D64 Sexual Assault: Clinical and Forensic Management a Virtual Practicum to Train Sexual Assault Forensic/Nurse Examiners

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The goals of this presentation are to (1) demonstrate the learning strategies utilized to develop a virtual practicum on the evaluation of sexual assault, and (2) reinforce the strategies and evidence documented in “A National Protocol for Sexual Assault Medical Forensic Examinations” developed by the Violence Against Women office in the Department of Justice.

Education of health care providers and the inter-professional team has been unique to each community and based on a variety of resources and beliefs. This virtual practicum utilizes the most recent evidence to demonstrate mentor/apprentice learning strategies standardized in the “National Protocol for Sexual Assault Medical Forensic Examinations.” This presentation will impact the forensic science community by helping to disseminate this important document to the forensic specialists charged with this type of evaluation.

The Interactive Media Laboratory (IML) at Dartmouth Medical School has developed a computer based learning program primarily for health care practitioners who may perform sexual assault medical forensic examinations and the inter-professional team members who have interest in the forensic medicolegal evaluation. The program applies IML’s Virtual Practicum model and methodologies to disseminate the concepts and procedures contained in *A National Protocol for Sexual Assault Medical Forensic Examinations* (National Protocol). This protocol was developed by the Office on Violence Against Women, U.S. Department of Justice, under the President’s DNA Initiative. OVW is a co-sponsor of this project with the National Institute of Justice. Dr. Henderson was the Project Director and Dr. Speck was a Content Expert.

The Virtual Practicum incorporates mentor/apprentice learning strategies, patient-based learning via rich-media virtual patients, lectures, computer-based activities, interviews with patients and practitioners, and role-modeling by experts, all in a graphically integrated learning environment. Drs. Speck and Henderson will describe this project and demonstrate the capabilities of the Virtual Practicum for the participants.

SANE, SAFE, National Protocol

D65 Mapping the Literature in Forensic Sciences: A Bibliometric Study of North American Journals From 1980 to 2005

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The goal of this presentation is to describe the evolution of forensic literature in North-American journals over more than twenty-five years. More precisely, it will draw a picture of our literature and describe developments and trends regarding numbers of author(s) per article, represented countries and international collaborations, fields of forensic sciences, types of articles and use of the scientific method.

This presentation will impact the forensic science community and/or humanity by providing new insight into forensic science literature. This better knowledge of our body of literature as a whole could help us assess our strengths and weaknesses, and to position ourselves on literature ethical issues.

Introduction: Bibliometric studies have increasingly being used over the last years. Those studies are useful to understand the evolution of literature or trends in particular fields or within a geographical area. However, in forensic sciences, bibliometry has barely been used yet. As a matter of fact, the few bibliometric analyses of forensic science literature that have been performed were mainly focused on most highly cited articles, most prolific authors, and impact factors.

Methods: The two North-American leading journals in forensic sciences were selected: the Journal of Forensic Sciences and the American Journal of Forensic Medicine and Pathology. All articles published in those journals in 1980, 1985, 1990, 1995, 2000 and 2005 were retrospectively analyzed, excluding editorials, guest editorials, tributes, and book reviews. For each article, the following features were compiled: number of author(s), author's country and international collaboration, related field of forensic sciences, and type of article. Furthermore, it was assessed if the article was using or not the scientific method, with testing of hypotheses by statistical analysis. A total of 1693 articles were examined from 1980 to 2005 at a 5-year interval: 1252 articles from the Journal of Forensic Sciences and 441 articles from the American Journal of Forensic Medicine and Pathology. The SPSS 15.0 software was used to perform statistical analyses at a threshold of significance of 5%. Mean values were compared using analysis of variance, while proportions were compared through Chi-square tests.

Results: Over the last twenty-five years, the number of articles per year has doubled. Meanwhile, the average number of author(s) per article has passed from 1.9 to 4.0, significantly increasing by more than twofold ($p=0.000$, $p<0.05$). The relative contribution of other countries in comparison to the United States has significantly increased from 19.5% to 70.8% ($p=0.000$, $p<0.05$), and articles from international collaboration have passed from 1.6% to 10.4%. Articles in the fields of anthropology, ballistic and biology/DNA have significantly increased over the years ($p<0.05$), while articles concerning questioned documents significantly decreased ($p<0.05$). No significant differences were noted for the progress of articles in the fields of chemistry, odontology, pathology and legal medicine, psychiatry, and psychology. As for the types of articles, technical note was the only type of articles showing a significant increase ($p<0.05$). Historical overviews, letters to the editor and review articles demonstrated a significant decrease ($p<0.05$), whereas no statistical differences were observed for case reports, case series and original studies ($p>0.05$). Finally, the number of studies using the scientific method has also significantly increased through the years, passing from 10.53% to 40.73% ($p=0.000$, $p<0.05$).

Conclusion: Forensic literature in North-American journals has expanded and enriched over the last quarter of century. As a matter of fact, the number of articles has increased, so did non-US contributors, international collaborations, and number of studies using the scientific method. However, the significant growth of the average number of author(s) per article could raise some ethical issues.

Forensic Sciences, Literature, Bibliometrics

D66 Don't Blame the Forensic Scientist!

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After attending this presentation, attendees will learn how efforts to improve forensic science go wrong when critics play a blame game after errors are discovered. They will learn that improvements in forensics can be made, but only if we stop blaming forensic scientists and start thinking about improved organizational structures.

This presentation will impact the forensic science community by addressing an issue that forensic lab directors are always concerned about, namely human error and quality control. Error rates and their relationship to structural redundancy will be discussed with a view toward enhancing laboratory administration.

Critics of forensics have seized on sensational cases of error in a way that has put forensic science under siege. The unfortunate result has been a tug-of-war between the critics of forensic science who call for oversight and regulation and the defenders of forensic science who wish to preserve their legitimate autonomy. This tug-of-war has grown into an increasingly urgent public dialogue on the reliability of forensic science. Reform is coming. It is vital that such reforms make things better, not worse. The forensic science community must act effectively to ensure not only the continued validity of forensic science, but also continued public trust in the most vitally scientific element of our criminal justice system. To ensure a good result, forensic scientists should emphasize the role of organizational structures in quality assurance.

A properly designed system of redundant testing ("structural redundancy") in forensic science would reduce both error rates and the direct money costs of administering the criminal justice system. As in other areas such as research science and information theory, structural redundancy is necessary for error correction. Structural redundancy reduces the costs of administering the criminal justice system because wrongful convictions are costly. Costs of incarceration are so high (over \$20,000 a year for each prisoner) that even when errors are rare, the costs of redundant testing are swamped by the savings they produce in the costs of incarcerating the wrongly convicted. In this sense, forensic tests are cheaper than prisons. Cost estimates based on public documents reveal that greater funding of forensic science is economical because forensic science is a bargain for the criminal justice system.

The presentation explains how the research team uses experimental techniques to study the connection between error rates and structural redundancy. Results so far suggest a strong connection and the possibility of reducing error rates through an improved organization of forensic science. The latest experimental results reveal that improvement comes from the benefits of structural redundancy and not from any improvement in the performance of individual examiners in the system. Thus, it is a mistake to blame individual forensic scientists when things go wrong. Instead we should look for better organization. In particular we should look for ways to put the principle of structural redundancy into place.

The project described will have a great impact on forensic science by helping to eliminate the blame game and by revealing both the correct principles and fine details of how to institute structural redundancy in forensic science. Reducing error rates in forensic science will benefit society by improving justice. Mistakes in the criminal justice system are costly. The project will benefit society as a whole by lowering incidence of such mistakes and thus their cost. It will also reduce the costs of administering the criminal justice system, which helps to justify an increase in the funding of forensic science.

Blame, Structural Redundancy, Error Reduction

D67 Morgue Operations in the Aftermath of Hurricane Katrina: A Radiology Perspective

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After attending this presentation, attendees will have a better understanding of the morgue operations conducted by the Disaster Mortuary Operational Response Teams (DMORT) following Hurricane Katrina.

This presentation will impact the forensic community and/or humanity by demonstrating the three generations of morgue operations and

the contribution of radiology and the radiographer in victim identification, providing insight into the interactions between the morgue components, specifically radiography, pathology, and anthropology.

On August 29, 2005, the worst national disaster to ever strike the United States occurred at 6:10 AM when Hurricane Katrina made landfall along the Gulf Coast. In its wake, it left an area larger than Great Britain in ruins; over 90,000 square miles of total devastation stretching from Florida to Louisiana. Hundreds were dead or missing and 1.5 million people were displaced. In the aftermath of this historic event, the DMORT teams from regions 4 and 6 deployed to begin the search, recovery and identification of the victims left behind by this horrific storm.

In the days following the initial deployment, the DMORT teams had to set up operations and provide team members with basic life support under conditions never before encountered: no power, no running water, no toilet facilities, no lodging, and extreme heat and humidity. The first generation of morgue operations was set up utilizing the DPMUs (deployable portable morgue units); fully equipped morgues palletized and ready for deployment via rail, truck or air. Region 4 set up in tents inside a damaged hangar in Gulfport, Mississippi, while region 6 set up under similar primitive conditions in a warehouse just outside Baton Rouge, Louisiana. The Gulfport operation was designated DMORT East, and the Baton Rouge operation DMORT West. For the initial deployment, the Radiography section had to work with the old equipment from previous deployments. This included battery-operated portable units, and conventional film and processing. Since darkrooms were required for film development, black visqueen was duct-taped to walls and ceilings to provide the light-tight environment needed for image processing. The heat, humidity, lack of ventilation, and strong chemicals necessary for processing presented an additional hazardous environment for the technologists and personnel assisting with film processing. Radiation safety was another factor that had to be taken into consideration. The primary factor for safety was distance, requiring that the x-ray units were contained within a perimeter of at least 6 feet from any other area. This meant that the darkroom had to be established outside the 6-foot limit to prevent image fogging and to protect unexposed film, which entailed carrying heavy cassettes some distance for processing. Lead aprons were provided for personnel operating the equipment, but due to the working conditions, it was almost impossible to wear the aprons. Instead, improvised shielding using folding chairs with lead aprons draped over the back provided a means of protecting personnel. On September 14, 2005, the new computed radiography (digital imaging) systems were delivered and put into operation. These systems meant that the conventional darkrooms and the associated problems could be eliminated. It also meant that image storage was no longer a problem, as the digital images could be stored on CD or on backup computers.

The first generation morgue at Gulfport was disassembled and personnel evacuated on September 22, 2005 when Hurricane Rita headed for the Gulf Coast. Once Rita had passed through, the second generation morgue set up under much better conditions on the water park at Gulfport. The environmental conditions were much better, and DMORT personnel were housed in an area hotel that was able to provide accommodations. During this phase, radiography proved to be a valuable resource in the identification process, working closely with pathology and anthropology in evaluating ante- and postmortem images, and reproducing antemortem images for comparison purposes. In November, 2005, DMORT East completed its work and began to phase out operations. During this period, a new facility, to be called the Victim Identification Center, was constructed on the site of a former leper colony at Carville, Louisiana, near Baton Rouge. Destined to become the largest morgue in the world and called the finest of its kind by some experts, it provided the third generation of operations in the aftermath of the hurricanes.

The Victim Identification Center sits on a secure 37-acre compound. Included within the fenced facility are dormitory-style buildings capable of housing 300 personnel along with a huge tension fabric structure that contains a complete kitchen with dining area, recreational and laundry facilities, warehouse, administrative offices, and overflow sleeping

accommodations for an additional 186 staff. The morgue, an 18,720 square-foot facility, contains ten separate analysis stations and is capable of processing up to 150 victims per day; however, the radiology section would need at least two units in operation if full-body x-rays are required. If the bodies are victims of an attack using explosives or ordinance, a portable C-arm unit, or perhaps an airport-type E scanner would be necessary for preliminary scanning to detect shrapnel or unexploded devices. The entire compound contains everything needed to perform up to 800 forensic examinations as well as casketing and re-casketing operations. In this final phase of operations, the radiology computer was interfaced with the pathology and anthropology computers, and all three sections were in adjacent bays, allowing the technologist to provide immediate images for viewing to the other areas. The pathologist and anthropologist had immediate access to the technologist for any assistance with image comparison or image manipulation. The configuration also allowed the technologist to provide training to the other sections on the features of the computed radiography software, including long bone measurement, magnification, annotation, image reversal techniques, and image retrieval. The computerized radiography system provided excellent quality images, whether the remains were soft tissue or skeletonized. In April, 2006, the third and final generation of morgues completed operations, and the facility went into stand-by status. Throughout operations, the radiology component proved its worth in both identification and cause of death.

Morgue, Radiology, Katrina

D68 Crimes Against Humanity and War Crimes in Colombia (1978-2005): In Pursuit of Forensic Evidence for Missing Persons

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After attending this presentation, attendees will gain an understanding of forced disappearance situation in Colombia and the current application of forensic sciences, especially anthropology and archaeology to solve these crimes.

Crimes against humanity and war crimes are being investigated in a social, legal and forensic perspective around the world (Roberge, MC, 1998). Countries such Argentina (Doretto, 2003) Iraq, the Former Yugoslavia, Guatemala, and Rwanda (PHRUSA, 1994), are receiving all the interest from forensic teams attending the United Nations (UN) and the International Committee of the Red Cross (ICRC) calls. This is not the case in Colombia. Every year from 1988, UN, ICRC and international Non-Governmental Organisations (NGOs), such Amnesty International or Human Rights Watch, produces annual reports about the critical situation of Human Rights and International Humanitarian Law in this South American country. National NGOs also reports these crimes but forensic investigations are limited for security, social, political, and economical reasons and especially because the internal armed conflict still remains.

As a result of the pressure from Civil Society, especially Human Rights NGOs and relatives of forced disappearance's victims, from 2000, the Colombian State had been working on the creation of laws (leyes) to judge the offenders (ASFADDES, 2003) as well as the implementation of two Truth Commissions. Both the National Search Commission of Missing Persons" (Comisión Nacional de Búsqueda de personas desaparecidas) and National Reparation and Reconciliation Commission" (Comisión Nacional de Reparación y Reconciliación) (PPDHDIH, 2004) are charged with the search for missing persons. Both Commissions will use forensic sciences, specially archaeology and anthropology in order to achieve their purposes.

Through this presentation the problem of forced disappearance in Colombia (1978-2004) is analyzed from several points of view: historical, legal, cultural, geographical, and forensic. Information comes from NGOs and some governmental institutions as the National Institute of Legal

Medicine, the Ombudsman Office (Defensoría del Pueblo) and the Inspector's Office (Procuraduría General de la Nación). Three cases will be exposed. Some of them are already finished with the location and identification of the victim but others are still being investigated.

Forensic Anthropology, Forensic Archaeology, Human Rights - Colombia

D69 Coping With Changing Legislation: Learning Lessons From the United Kingdom, Reducing the DNA Backlog, the Role of Facilities in Addressing Crime, Use of Robotics and Expert Systems in Forensic Science

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The goal of this presentation is to help attendees understand lessons learned from the United Kingdom to help reduce DNA backlog.

Coping with changing legislation: learning lessons from the United Kingdom: Legislation such as proposition 69 in California is an example of the way that the United States is transforming its approach to the use of forensic science. It is set to have a major impact upon both convictions and upon domestic security. But as legislation changes, there is a growing need to develop capabilities and services to respond to the changing needs of the sector. By drawing upon some of the world's most respected and established scientific technology, the United Kingdom is able to work in partnership with bodies across the United States and further afield to address issues such as DNA backlogging and terrorism

Reducing the DNA backlog: Even as far back as 2005, data from the Bureau of Justice Statistics in the States referred to a "disturbing trend of increased cases and increased backlog in all disciplines of forensic science." The facts certainly present a pressing case for change. Interestingly, the current plight of the US backlog follows a similar pattern to what has already occurred in the United Kingdom. The challenge now is to translate the knowledge and best practice learned, across the pond and to use it to assist the States in tackling the backlog, efficiently and effectively. When it comes to DNA processing, the figures in the United Kingdom are impressive, with over 0.5 million samples processed a year, each within a three to five day timeframe. Additionally, as analyzed samples have increased, staff numbers have dramatically decreased. But it hasn't always been that way. How has the United Kingdom done it and what lessons can the United States learn?

The role of facilities in addressing crime: When it comes to forensics, the building itself is just the shell – what is critical is the technology incorporated within, and its ability to integrate with existing systems and procedures. The need for a temporary structure can be triggered by a number of factors – for some organizations it's about providing an adjunct to an existing facility in order to cope with immediate issues such as backlogging. For others, there's a need for an interim facility whilst a permanent solution is found, for some just a commercial desire to find out whether a forensics laboratory will reap benefits for their bottom line. Whatever the trigger, it is clear that a "quick fix," non-custom facility simply will not do. The United States currently do not have enough facilities to cope with growing demand triggered by legislation such as Proposition 69. The United Kingdom has been through this and come out the other side thanks to advanced temporary facilities.

Use of robotics and expert systems in forensic science: Automation and the use of expert systems present one solution that the United States is beginning to investigate, and it's a path that is well trodden in the United Kingdom. Over the last ten years the United Kingdom has worked to

develop robotics and wider technology to ensure that we are able to manage whatever level of samples we are presented with. From this experience we have learnt a valuable lesson: it's not about the technology but about how you integrate it with the rest of the process, and feed it efficiently. Using technical robotic instruments to remove mundane duties for staff has proved hugely successful. It is human nature that after processing hundreds of samples every day, people get tired, distracted and they make mistakes – robots, on the other hand, do not. The use of robotics represented a real leap of faith for forensics teams in the United Kingdom. Quality of programming is critical, and although existing systems were used, considerable time and resources were spent designing protocols for them that instructed the machines to extract DNA, measure, and amplify it as required. As a result however there has been an increase in the number of samples processed and in turn improving match rates. By catching even those criminals committing minor offences, as the statistics show, the United Kingdom's populace are saved from a whole host of future potential crimes.

DNA Backlog, DNA Processing, Crime Reduction

D70 The Role of the Radiographer in Forensic Medical Investigation

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After attending this presentation, attendees will understand range of diagnostic imaging procedures used in support of forensic investigation and the key role played by the radiographer or radiologic technologist.

This presentation will impact the forensic community by highlighting the need for core standards and guidelines in forensic radiography, supported by training programs for radiographers.

Purpose: A review of the role of the radiographer in support of forensic medical investigation in South Africa, Australia, Argentina, the United States, and the United Kingdom.

Materials and Methods: Two to three university centers of Forensic Pathology were visited in each country between December 2005 and March 2006, as part of a Winston Churchill Traveling Fellowship. Through observation, discussion, and semi-structured interviews with radiography service users, service providers, and educators, the following aspects in each center were assessed:

- Service philosophy and scope of practice
- Use and availability of technologies
- Organizational roles and responsibilities of those undertaking forensic radiography examinations; and
- Current training programs

Relevant published literature was also reviewed.

Results: Marked differences in utilization and availability of services between countries, and lesser differences between centers within each country, were evident. The perception of the importance of radiography as a tool of the forensic investigator are influenced by differing levels of violent crime, degree of involvement of radiographers and radiologists, available resources, and differences between education systems for radiographers and pathology technicians. Access to advanced imaging techniques is at present limited to those centers attracting research funding or where cultural issues are significant, but many practitioners report an increasing use of and interest in forensic medical imaging.

Conclusions: Radiographers play an increasingly important role in forensic medical investigation. Core standards and guidelines in forensic radiography should be formulated and supported by training programs for radiographers.

Radiography, Radiology, Education

D71 The Issue of Computer Generated Images in Child Pornography Cases

Amanda Broyles, MAM, Federal Bureau of Investigation, Building 27958A, Quantico, VA 22135*

After attending this presentation, participants will have an understanding of the legal basis for the need to demonstrate that children depicted in pornographic images are real victims and not computer-generated, or virtual, children. Also, participants will be made aware of a recent ruling which expressed the opinion that an expert is not always necessary to demonstrate the reality of victims. Certain often misused terms will be discussed relevant to this issue. The participant will be given an overview of several techniques employed by CG artists to render a virtual person, including a discussion of the difficulties and the shortcomings of these techniques. Lastly, methods of investigation will be discussed. These include the need for identifying any known victims and the evaluation of the image properties. Examples of properties that can be evaluated are photographic properties, such as lighting and shadows, and human properties, such as skin texture and details of the hair. Students will also learn the advantage of having videos or image series, multiple images depicting the same objects, people, or settings, as evidence when the reality of the images and scenes is questioned.

This presentation will impact the forensic science community by educating the audience as to the relevant issues surrounding the prosecution of child pornography in the post-Ashcroft v. Free Speech era. The issue of showing that the individuals depicted represent real children, as opposed to computer-generated children, potentially impacts every case involving child pornography in the United States. While it is not a point of contention in every case, investigators and prosecutors need to understand the state-of-the-art and be prepared with general knowledge and case citations if the issue is challenged. A correct understanding of the issues leads to better case preparation.

This lecture will begin with a description of the impact of the 2002 ruling of Ashcroft v. Free Speech on child pornography cases in the United States. The lecture will address the question, "How easy is it to create a virtual child?" The state-of-the-art in CG (computer-generated or computer graphics) technology will be discussed, as well as the feasibility of rendering a virtual child. With the state of the current technology in mind, characteristics will be discussed that would allow one to distinguish between the real and the virtual.

Virtual, Pornography, Computer Generated

D72 The Detection and Authentication of Real Digital Photographic Images in Light of Ashcroft, Attorney General, et al. vs. Free Speech Coalition

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The goals of this presentation are to (1) report current state-of-the-art in Computer Graphics (CG) technology, (2) report current legal precedence including Ashcroft v. Free Speech Coalition and subsequent cases, (3) provide an explanation of the JPEG image structure, (4) describe artifacts found in real (i.e., non-CG) digital images, and (5) describe artifacts found in CG digital images

In ASHCROFT, ATTORNEY GENERAL, et al. v. FREE SPEECH COALITION (April 16, 2002) the Supreme Court of the United States decided to overturn parts of the Child Pornography Prevention Act (CPPA) of 1996. Specifically the Court ruled that in order to prosecute child pornography cases, the Government must prove that a real child was harmed. This presentation will impact the forensic science community by

demonstrating how since this decision, this "virtual child pornography" defense has been frequently used by accused parties, and has been a challenge to address.

The Department of Defense Computer Forensic Laboratory (DCFL) Image Authentication Process (IAP) has shown that real (non computer generated) digital photographic images contain numerous detectable artifacts.

In ASHCROFT, ATTORNEY GENERAL, et al. v. FREE SPEECH COALITION (April 16, 2002) the Supreme Court of the United States decided to overturn parts of the Child Pornography Prevention Act (CPPA) of 1996. Specifically the Court ruled that in order to prosecute child pornography cases, the Government must prove that a real child was harmed. Since this decision, this "virtual child pornography" defense has been frequently used by accused parties, and has been a challenge to address. Confounding the issue, many fact witnesses (investigators, support counselors, etc) who are currently able to testify to victim identity are aging and in some cases passing away.

The Department of Defense Computer Forensic Laboratory (DCFL) Image Authentication Process (IAP) has shown that real (non computer generated) digital photographic images contain numerous detectable artifacts.

The process consists of four major steps. First, a unique mathematical "fingerprint" of the image called the message digest version 5 (MD5) value is calculated and compared against values stored in the National Center for Missing and Exploited Children (NCMEC) database. Each picture in the NCMEC database contains an identified known child victim.

Second, the metadata contained in the image is extracted and analyzed for artifacts of origin. This includes both metadata that is statically available such as camera make and model as data in the image and metadata that is calculated from the properties of the picture file itself.

The third step in the process is to extract and analyze the image quantization table for artifacts of origin. Each JPEG image contains a quantization table that is generated during the second of three compression steps (discrete cosine transform, quantization, Huffman coding). This table varies from camera to camera and program to program.

During the fourth and final step a discriminatory examination of the Red, Green, and Blue (RGB) values for each pixel is mapped and incorporated into a number of mathematical equations. These equations compare each pixel to its neighbors in order to detect such things as flatness, lighting differential and human skin depth.

Data produced by the process shows that there is a significant, quantifiable difference between real and computer generated (CG) images.

Computer Graphics, Child Pornography, Image Authentication

D73 Digital Image Forensics

Hany Farid, PhD, Dartmouth College, 6211 Sudikoff Lab, Hanover, NH 03755*

After attending this presentation, participants will learn about cutting edge techniques in digital image forensics and how they can be applied in real-world settings.

This presentation will impact the forensic science community by describing the new and important field of digital image forensics with implications to the Law, Media, Science, and Society.

Today's technology allows digital media to be altered and manipulated in ways that were impossible twenty years ago. The impact of this technology is being felt in nearly every corner of our lives, from the courts to the media, politics, business, and science. As this technology continues to evolve it will become increasingly more important for the science of digital forensics to keep pace. This presentation will describe state of the art techniques in digital image forensics.

Digital watermarking has been proposed as a means by which an image can be authenticated. This approach works by inserting at the time

of recording an imperceptible digital code (a watermark) into the image. With the assumption that tampering will alter a watermark, an image can be authenticated by verifying that the extracted watermark is the same as that which was inserted. The major drawback of this approach is that a watermark must be inserted at precisely the time of recording, which limits this approach to specially equipped digital cameras.

In contrast, recent advances in digital forensics operate in the absence of any watermark or specialized hardware. With the assumption that tampering disturbs certain underlying statistical properties of an image, these forensic techniques can detect specific forms of tampering.

Air-brushing or re-touching can be detected by measuring deviations of the underlying color filter array correlations. Specifically, virtually all digital cameras record only a subset of all the pixels needed for a full-resolution color image. Instead, only a subset of the pixels are recorded by a color filter array (CFA) placed atop the digital sensor. The most frequently used CFA, the Bayer array, employs three color filters: red, green, and blue. Since only a single color sample is recorded at each pixel location, the other two color samples must be estimated from the neighboring samples in order to obtain a three-channel color image. The estimation of the missing color samples is referred to as CFA interpolation or demosaicking. In its simplest form, the missing pixels are filled in by spatially averaging the recorded values. Since the CFA is arranged in a periodic pattern, a periodic set of pixels will be precisely correlated to their neighbors according to the CFA interpolation algorithm. When an image is re-touched, it is likely that these correlations will be destroyed. As such, the presence or lack of these correlations can be used to authenticate an image, or expose it as a forgery.

A digital composite of two people can be detected by measuring differences in the direction to the illuminating light sources from their faces and body. By making some initial simplifying assumptions about the light and the surface being illuminated, we can mathematically express how much light a surface should receive as a function of its position relative to the light. A surface that is directly facing the light, for example, will be brighter than a surface that is turned away from the light. Once expressed in this form, standard techniques can be used to determine the direction to the light source for any object or person in an image. Any inconsistencies in lighting can then be used as evidence of tampering.

Duplication or cloning is a simple and powerful form of manipulation used to remove objects or people from an image. This form of tampering can be detected by first partitioning an image into small blocks. The blocks are then re-ordered so that they are placed a distance to each other that is proportional to the differences in their pixel colors. With identical and highly similar blocks neighboring each other in the re-ordered sequence, a region growing algorithm combines any significant number of neighboring blocks that are consistent with the cloning of an image region. Since it is statistically unlikely to find identical and spatially coherent regions in an image, their presence can then be used as evidence of tampering.

These and other image forensic techniques will be described. In addition, demonstrations of their use in exposing digital tampering will be provided.

Image Forensics, Image Tampering, Digital Forgeries

D74 Skin Tone Detection for Contraband Image Analysis

Marc Rogers, PhD, Abhishek Choudhury, and William B. Gillam, MSc, Purdue University, 401 North Grant St, Knoy Hall of Technology Room 255, West Lafayette, IN 47907-2021; and Keith Watson, and Richard P. Mislan, ABD, Purdue University, PO Box 2165, West Lafayette, IN 47907*

The goals of this presentation are to provide an overview of skin tone filters for contraband image analysis and to obtain feedback from the community on the development and application of a novel approach.

The development of the skin tone detection filter greatly enhances the ability to isolate those images that have a high probability of depicting child

pornography. This presentation will impact the forensic science community by bringing practitioners up to speed with the latest developments in digital evidence.

After attending this presentation, attendees will more aware of some of the developments in contraband image analysis algorithm development.

The presentation discusses the development of a skin tone detection algorithm to be used by first responder digital forensic tools such as File Hound developed at Purdue University. File Hound is a “field analysis” software that is currently being used by over 100 law enforcement agencies worldwide. It is mainly used in forensic investigations to search for and identify pornographic images from a storage device. Ever since the conception of File Hound several steps have been taken to improve its performance and expand its features. One such feature added is a skin tone detection filter that can identify images with a large skin count. This filter was developed based on the theory that there is a strong correlation between images with a large skin count and images that are pornographic in nature. A novel skin tone detection filter was developed for these purposes and this filter was tested against images obtained from the Compaq Image database for skin tone detection. The filter was successful at identifying skin tone across races and differing illumination.

Digital Evidence, Computer Forensics, Skin Tone

D75 Blind Verification of Image and Video Authentication Examinations

Richard W. Vorder Bruegge, PhD, Federal Bureau of Investigation, Operational Technology Division –Forensic Audio, Video and Image Analysis Unit, Building 27958A, Pod E, Quantico, VA 22135*

After attending this presentation, attendees will learn how image analysts authenticate images and videos as depicting real people and events. They will also learn of multiple instances in which subsequent investigation verified conclusions reached by FBI examiners.

This presentation will impact the forensic science community by documenting instances in which the results of image and video authentication examinations have been verified after the fact, thus meeting the *Daubert* criterion that this technique be tested.

Blind verification is recognized by the forensic science community as an excellent way to demonstrate that examiners and laboratories – as well as specific forensic techniques and processes – produce results that are accurate and reliable. Blind verification is particularly relevant to many image and video authentication examination requests handled by the FBI’s Forensic Audio, Video and Image Analysis Unit (FAVIAU). FBI personnel have been conducting authentication examinations of images for decades.

This paper will describe how the results of multiple FAVIAU image and video authentication examinations have been confirmed through investigative work performed after the examinations were completed. Included among these confirmations are: (1) authentication of a beheading video as real (confirmed through the subsequent recovery of the victim’s headless torso and head), (2) identification of a “snuff film” as a forgery (confirmed by disclosure of the forgery by the creator as a demonstration of his ability in the realm of special effects), and (3) authentication of multiple child pornography images and videos as being real (confirmed by the subsequent identification of previously unidentified victims depicted as real children). It is proposed that such confirmations effectively constitute “blind verification,” thereby demonstrating the validity of not just the individual examinations, but the validity of the techniques and processes used in these examinations, as well. Furthermore, such a demonstration provides a direct way of addressing the *Daubert* criterion regarding whether a technique has been tested or is capable of being tested.

The Scientific Working Group on Imaging Technology (SWGIT) describes forensic image authentication as “...the application of image science and domain expertise to discern if a questioned image or video is an accurate representation of the original data by some defined

criteria...Questions involved...include issues of image manipulation, image creation, and consistency with prior knowledge about the circumstances depicted.”¹ This type of authentication differs from the necessity to authenticate evidence as a precondition to acceptance in court (e.g., testimony from a fact-witness that a photograph is a “...true and accurate depiction of the scene at the time the photograph was taken...”). Likewise, image and video “authenticity” should not be confused with image and video “integrity,” which specifically addresses whether an image or video recording has been altered or modified from its original state, regardless of whether such alteration changes the intrinsic meaning of the recording.

The question raised in forensic image authentication exams effectively comes down to “Did the events depicted occur as they appear in the picture or pictures?” Currently, FAVIAU is most frequently asked to perform image authentication examinations in cases involving child pornography. In such instances, the defense may claim that the images or videos charged in the case do not, in fact, depict real people and events. This may include the suggestion that the images or videos are computer-generated (CG) or that images have been manipulated in some way to make it appear that children were engaged in sexually explicit behavior, when they actually were not. For example, it might be suggested that the face and/or body of a minor was inserted to replace that of an adult in a sexually explicit scene that originally involved only adults.

Another type of case in which image authentication exams are requested involves purported executions or murders depicted in videos. While execution videos have become something of a staple on the Internet as a propaganda tool of terrorists, there remains a subset of videos known as “snuff films” that have nothing to do with terrorism, per se. In either case, investigators are anxious to determine whether a real crime is depicted in the video, or whether the video is merely an attempt at misdirection or some other purpose.

The process by which such images and videos are examined to determine authenticity can involve multiple tasks. As SWGIT notes, “[t]hese tasks include...evaluation of image structure and content.”² Evaluation of image structure may include observation of detailed characteristics of an image to detect artifacts of manipulation, or it may involve analysis of metadata to determine the source or provenance of an image, such as camera make and model, or date and time information. Content evaluation may involve observation to detect manipulation in continuity, or specific characteristics of the content, such as staging or features that are out of place or time. For example, when conducting an examination to determine whether a human being depicted in an image or video is real and not CG, there are specific characteristics of human beings that are known to be difficult to recreate in a CG depictions. Such features include fine details of the skin, eyes, and hair.

This paper will describe some of the specialized software tools used to assist in the detailed examination of the images and videos, including those used to examine the metadata and structure of individual digital files. Finally, the criteria used to establish authenticity will also be discussed.

References:

¹ SWGIT, “Best Practices for Image Authentication”, available on line at theiai.org/guidelines/swgit/guidelines/section_14_v1-0.pdf.

² Ibid.

Image Authentication, Image Manipulation, Blind Verification

D76 Examination of Digital Video Formats Such as MPEG-1, MPEG-2, MPEG-4, 3GP, and AVI

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The goals of this presentation are to describe what kinds of video formats exist, explain what to do if a format is not playable, describe how to repair broken video streams, and to discuss integrity.

This presentation will impact the forensic science community by describing methods to repair a broken video stream with provided software.

Nowadays many video streams arrive in the laboratory for examination in digital format. Questions range from analysis of integrity, to finding and repairing fragmented or otherwise damaged video files. The number of digital CCTV-recordings is expanding due to security concerns. In many places surveillance cameras are present that can record crimes scenes. Furthermore, more people have phones with cameras in them.

The formats that are widely used on the market range from MPEG-1, MPEG-2, MPEG-4, 3GP and AVI. Many more formats exist, and sometimes they are also proprietary. Often CCTV-manufacturers have proprietary formats.

For forensic examination of damaged files it is important to know in detail on byte-level how a video file format is built up. The different standards of the file formats describe in detail how the file should be composed. Also manufacturers might implement the video file formats slightly different from the standard, such that regular players of video do not show the files correctly.

Damaged files might be found in unallocated clusters and slack space of hard drives and other data carriers. Also, one may find damaged or fragmented files in drives with a corrupted file system, or when analyzing internet interception data.

For analysis, we have developed the open source software tool DEFRASER, which can be downloaded from <http://defraser.sourceforge.net>. In this software it is possible to read in files that might include video streams. Also images of hard drives can be searched for video information in them. The different formats: MPEG-1, MPEG-2, MPEG-4, 3GP and AVI are supported. It is expected that other commonly used formats will follow. The software will reduce work that is needed otherwise since the specifications of the formats are included.

Simple actions such as using a header from another video file from the same camera is possible. Also more in-depth analysis of the separate data blocks is possible. It is also possible to write plug-ins for this software to analyze different formats.

In this presentation some examples are given of wiped video files which should be recovered. The software also keeps logs in order to know later how a file has been recovered. It should be combined with the use of regular hex editor, for the final forensic analysis. Hidden data such as date and time-stamps in the video files are important for investigation of integrity.

The tool itself is made open source such that it is easily possible to store and exchange knowledge of file formats for analysis.

Video, Formats, CODECS

D77 Digital Video Forensics

Hany Farid, PhD, Dartmouth College, 6211 Sudikoff Lab, Hanover, NH 03755*

After attending this presentation, participants will learn about cutting edge techniques in digital video forensics and how they can be applied in real-world settings.

This presentation will impact the forensic science community by describing the new and important field of digital video forensics with implications to the Law, Media, Science, and Society.

Popular websites such as YouTube have given rise to a proliferation of digital video. Combined with increasingly sophisticated users equipped with cell phones and digital cameras that can record video, the Internet is awash with digital video. When coupled with sophisticated video editing software, we have begun to see an increase in the number and quality of doctored video. This technology is impacting nearly every corner of our lives, from the courts to the media, politics, business, and science. As this technology continues to evolve it will become increasingly more important for the science of digital forensics to keep pace. This presentation will describe state of the art techniques in digital video forensics.

Digital watermarking has been proposed as a means by which a video can be authenticated. This approach works by inserting at the time of recording an imperceptible digital code (a watermark) into the video. With the assumption that tampering will alter a watermark, a video can be authenticated by verifying that the extracted watermark is the same as that which was inserted. The major drawback of this approach is that a watermark must be inserted at precisely the time of recording, which limits this approach to specially equipped digital cameras.

In contrast, recent advances in digital forensics operate in the absence of any watermark or specialized hardware. With the assumption that tampering disturbs certain underlying statistical properties of a video, these forensic techniques can detect specific forms of tampering.

The MPEG video compression scheme has emerged as a virtual standard. This lossy compression scheme introduces specific spatial and temporal correlations into a compressed video. When a video is edited and re-compressed, static and temporal artifacts are introduced that are distinct from an originally recorded MPEG video. These double compression artifacts can be used to determine that a video was, at a minimum, subject to some secondary processing after recording.

Most video cameras do not simultaneously record the even and odd scan lines of a single frame. Instead, one-half of the scan lines are recorded at time T, while the other half are recorded at time T+1. In an interlaced video, these scan lines are simply combined to create a full frame. While this approach allows for better temporal sampling, it introduces spatial “combing” artifacts for quickly moving objects. In order to minimize these artifacts, a de-interlaced video will combine the even and odd lines in a more sensible way, usually relying on some form of spatial and temporal interpolation. For de-interlaced video, the correlations introduced by the camera or software can be quantified, and deviations of these correlations can be used as evidence of tampering. For interlaced video, the motion between fields of a single frame and across fields of neighboring frames should be equal. Deviations of this motion are used to detect tampering.

Sophisticated video editing software allows for objects and people to be added to complex and dynamic scenes. The camera motion can be estimated from individual objects or people in a video and any inconsistencies in camera motion are evidence of tampering.

These and other video forensic techniques will be described. In addition, demonstrations of their use in exposing digital tampering will be provided.

Video Forensics, Video Tampering, Video Forgeries

D78 Measurement of Lighting Conditions at a Police Traffic Stop

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After attending this presentation, the attendees will become familiar with the testing program being developed by NIST and used by IACP.

The presentation will impact the forensic science community by serving as the basis for a testing program being developed by NIST and used by IACP to help police agencies purchase quality systems and obtain useful forensic video.

In-car video recording is growing rapidly but there are no standards for the systems purchased by police agencies. To help assure that agencies purchase quality systems the International Association of Chiefs of Police has led a program to develop standards. As part of that effort, the National Institute of Standards and Technology has developed a prototype testing device in the form of a complex scene generator. To provide guidelines for inputs into the design of scene content, the light available at a traffic stop was measured. Specifically, measured were aggregate color temperature, spectral reflectance of typical scene contents and reflectance of light from key elements such as the target car, its license plate, and the officer at the side of the target car. In addition measurements were made of the dynamic range of typical video camera systems. It was found that the color temperatures were very much as expected, the spectral reflectance were not highly selective and the range of reflectance from key scene elements was greater than the dynamic range of the typical camera system.

Lighting, In-Car Video, Traffic Stop

D79 Identification of Images From Cameras

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The goal of this presentation is to describe methods for identifying an image from a camera.

This presentation will impact the forensic science community by validating methods of pixel defects and noise.

In forensic casework the question of authenticity has to be answered if a certain image has allegedly been made with a specific digital camera. Another question that may be asked is if two images have been made with the same camera. In order to answer this question noise, pixel artifacts, and information from the headers and footers of image files can be used. Furthermore, the method of examination of pixel artifacts combined with headers and footers is useful for integrity research: finding traces of manipulation (e.g., cut and paste) of the images.

A digital image is composed from a matrix of pixels (picture elements). For capturing a digital image CMOS (Complementary Metal Oxide Semiconductor) or Charge Coupled Device (CCD) are used in cameras. When manufacturing image sensors, they sometimes contain artifacts. An artifact is visible in the image as a pixel artifact if the image sensor element has a different light sensitivity compared to the surrounding image sensor elements.

For the examination of pixel artifacts we have developed a standard operating procedure in our forensic casework. For the examination there are two approaches. If the camera is available, test images are made with the camera with a white, grey or a black surface. These images are used as a reference set. If the camera is not available, one set of images as reference set will be used.

In some of our casework pixel artifacts could be visualized without averaging or image processing, since they were visible in the images themselves without any processing. However, for visualizing the pixel artifacts it is often necessary to add and average the intensities of the

images. As a result, fluctuations in the images due to the image itself will be averaged. In order to visualize the pixel artifacts a filter, for instance a median filter can be used.

The locations of the pixel artifacts in the reference images are compared with the location of the pixel artifacts of the questioned images. If the locations of the pixel artifacts agree with each other, this provides strong support for the hypothesis that they have been made with the same camera. The conclusions are not quantitative however, since not enough statistical data is available from the randomness of pixel artifacts.

Conclusions from pixel artifacts are reported as level of support to the hypothesis that an image has been acquired with a specific camera, and/or the level of support to the hypothesis that they have been acquired by a different camera. The following levels of support can be given: “no support”, “limited support”, “moderate support”, “strong support”, or “very strong support”. In cases with similar support to both hypotheses, no conclusion can be drawn due to discrepancies.

Header and footer-information is often available in the digital files that are received. The information in the headers and footers is not visible in the image itself, however by using software (for example a hexviewer) the information can be made available. In JPEG-images from cameras this information often provides camera settings and brand and type of the camera itself, and sometimes provides information with which software the image has been edited. It is possible to modify the header and footer information by using software, so for forensic casework the examiner has to be aware of this possibility before drawing conclusions. If the header provides information that the image has been taken with a specific camera, it is possible that someone has altered the contents of this header, and that the picture actually has been taken with a different camera.

Another method is investigating the noise that is always present in digital images. The various causes for noise in digital images are:

- Photo response non-uniformity
- Photon shot noise
- Dark current
- Dark current shot noise
- Reset noise
- Amplifier gain non-uniformity
- Quantization noise

Most of these noise contributions are caused by a stochastic process and thus different from frame to frame. Two causes are, to a certain extent, constant from frame to frame: the photo response non-uniformity (PRNU) and the dark current. The former is a result of minor differences in sensitivity to a certain intensity and is easily visible in frames of constant illumination, so-called flat field images. In the latter case, noise is added by thermally generated free charge within a pixel. This charge generates a signal even when no light is measured by the sensor, hence the name “dark current.”

Both mechanisms are introduced during manufacturing of the sensor and are a result of numerous causes, e.g., material inhomogeneity, slight non-idealities in the lithography optics, dust particles during any stage of the production process, etc. Even though these contributions to the noise are not really noise in that the resulting signal is not random, they introduce noise-like deviations from the ideal, noise-free image: pixel-to-pixel variations of intensity in the order of 1% full scale.

Of the two contributions, the PRNU in pictures taken under normal circumstances (regular lighting conditions, shutter times below one eighth of a second, room temperature) is dominant over the dark current contribution. As PRNU is a constant pattern, this pattern can be used to identify the camera that took the picture. To do so, a reference pattern is obtained by means of flat fielding. To remove the random components of the noise, a large number of flat field images was taken and averaged.

To compare a given picture with such a reference pattern, the noise has to be extracted. This is done by applying a Gauss filter which removes scene information from the obtained noise. The resulting pattern is then compared to the reference pattern by means of the two-dimensional cross correlation.

For this research a large collection of cameras was available, among which webcams, phone cams, and handheld compact cameras, of varying quality and price. Of each model, multiple cameras were tested.

Noise, Camera, Identification

D80 Digital Cameras as Evidence: Cautions and Tips

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After attending this presentation, attendees will understand the importance of referencing the user’s manual as soon as possible when dealing with any digital camera. The importance of that step cannot be overemphasized and is the primary lesson each participant must understand. The attendee will also learn that the evidence may be time sensitive and should be treated as such. The main issue with regard to time sensitivity concerns a loss of power. A loss of power may mean a loss of evidence. The attendee will also be taught information about storage and media concerns when dealing with digital cameras as evidence. For example, several points will be covered with regard to internal memory. Practical advice for searches will also be given.

This presentation will impact the forensic science community by providing information regarding digital cameras as evidence. If digital cameras are handled improperly, evidence can be lost. Therefore, it is important to understand certain issues such as power and storage. This presentation will help investigators learn the forensic aspects of dealing with digital cameras as evidence.

It is common for digital camera models to stay on the market between three and six months. With such a turnover rate and the large number of manufacturers, it is no wonder that there is such great variety in models and styles that are or have been available. It is also no wonder that law enforcement and forensic scientists are seeing increasing numbers of digital cameras as evidence. As with any piece of evidence, an investigator, law enforcement officer, or forensic scientist must know how to properly handle and treat that evidence. This lecture will discuss tips and cautions for working with digital cameras. Experiences and lessons learned from research for a digital camera database and from conducting examinations of digital cameras will be shared. The intended audience is anyone from first responders and evidence response teams to laboratory personnel.

Digital Camera, Recommendations, Search

D81 Identification of an Automobile Make and Model From Digital Video - A “Cold Hit”

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After attending this presentation, attendees will learn how automobile make and model identifications from images are performed and will learn about resources available to them.

This presentation will impact the forensic science community by alerting the attendee to resources available to assist them in automobile make and model identifications from surveillance images.

Attendees will learn how image analysts determine the make and model of automobiles recorded in surveillance video, including databases and other reference materials available to them.

Surveillance cameras can provide images that are useful in investigations. In many cases, a surveillance image from a crime scene, such as a bank that was robbed, may enable investigators to identify a suspect, either because the investigators are familiar with the subject or

because a member of the public recognizes the individual. At other times, images depicting a suspected getaway vehicle may be used to generate leads or help narrow the list of potential suspects. This paper will describe an instance in which the identification of a vehicle's make and model from the surveillance images led directly to the identification of a suspect who was ultimately convicted of the crime.

A bank in Coeur d'Alene, Idaho was robbed in December, 2003. Investigators had few leads besides surveillance video. Video images depicting partial views of the robber's face were not enough to allow investigators to develop a suspect. Another piece of video evidence showed a vehicle thought to be the "getaway car", but investigators could not determine the make and model. Therefore, they sent this video to the FBI Digital Evidence Laboratory's Forensic Audio, Video and Image Analysis Unit (FAVIAU) in Quantico, Virginia. The request was made to identify the make and model of the vehicle.

When a case requesting make and model is received in FAVIAU, the first step in the forensic process is to extract the best images available from the questioned video. In this case, the surveillance video consisted of an AVI file downloaded from a digital closed-circuit television system. Once still images are extracted, they are processed to enhance the visibility of detail within the images. With the enhanced images in hand, the process of identifying the make and model of the vehicle begins with the distribution of the enhanced images to other examiners and technical personnel familiar with a wide variety of vehicles, in the hope that one of them will recognize the make and model. This process invariably leads to the identification of a number of potential candidates. These candidates are then compared by the examiner against available reference materials and the list of potential candidates is further reduced, until it is determined that no further reduction in the list is possible. The process is the same as that performed in any photographic comparison – vehicles which do not share class characteristics with the questioned vehicle are eliminated.

The FAVIAU manages a reference collection called the "National Automotive Image File" (NAIF), which contains materials collected from automobile manufacturers for over thirty years. The NAIF was started in the 1970's as an adjunct to the FBI Laboratory's automotive paint chip file, which is used in hit-and-run cases. The NAIF contains brochures, photos, slides, and digital media produced by the manufacturers for sales and marketing purposes. In the late 1990's, using funds provided by the National Institute of Justice, some of these materials were incorporated into a server-based digital database called the "Digital Automotive Image System" (DAIS). In early 2007, with the support of the Technical Support Working Group (TSWG), a DVD-based version of the DAIS was produced and distributed to over 18,000 agencies in the U.S. The DAIS includes both thumbnail and high resolution images of thousands of vehicles dating to the 1980's, and it is searchable based on parameters such as make, model, number of doors, type of vehicle and size. In addition to the NAIF and DAIS, the Internet can also serve as a valuable source of information on automobiles – especially since the NAIF and DAIS often lack information on late model vehicles.

The review of the images in the Coeur d'Alene bank robbery case ultimately led an investigator to suggest that the vehicle in question was an Oldsmobile Toronado, a vehicle manufactured in the late 1980's and early 1990s. The Toronado, a version of which was also called the "Trofeo", was not included in the DAIS, so brochures depicting this vehicle were found in the NAIF and its characteristics were compared against the questioned vehicle. As with most vehicles that are in production for more than a year or two, the Toronado underwent modifications during the course of its production run. It was found that the class characteristics of the questioned vehicle, including the passenger compartment outline and the configuration of lights, were only consistent with Toronados produced between 1990 and 1992.

Investigators took this information, queried motor vehicle records for the northern 5 counties of Idaho and located approximately 20 matching vehicles. Only one of the matching vehicles was of a color matching that of the questioned vehicle. This vehicle was owned by a woman whose

husband was recognized by investigators as being consistent with the bank robber. He was subsequently arrested, tried, and convicted in the robbery.

In most make and model identification examinations conducted by FAVIAU, it is not unusual for such a search of motor vehicle records to return hundreds or thousands of possible matches. This case represented the first known instance of a "cold hit" in which the make and model identification led directly to the apprehension of the individual ultimately convicted of the crime.

Image Analysis, Automobile Identification, Digital Video

D82 Are Camouflage Uniforms Unique? Estimating the Probability of Accidental Match for Camouflage Uniforms

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The educational objective of this presentation is to introduce and familiarize forensic scientists and investigators with new, quantitative methods and tools for evaluating matching of camouflage uniforms.

This presentation will impact the forensic science community by disseminating information about new forensic technology, thus investigators will know that it is available when confronted with certain types of uniform matching challenges.

It is well known that criminals and terrorists have worn camouflaged and military clothing during the commission of terrorist acts, robberies and other felonies. Fortunately, the increase in video surveillance means that these criminal acts are often caught on digital or analog media, which in turn becomes forensic evidence useful for analysis. In these videos the subject's face is not always visible for further identification, thus non-facial clues must be studied in an attempt to establish identity. The association of a garment worn during the criminal act, and appearing in the surveillance video, to the suspect is a key area of interest to forensic investigators.

In forensic investigations surrounding military environments, many of the garments encountered are part of a camouflage uniform. The problem faced by investigators in such environments, then, is how to identify suspects solely upon matches of a camouflage pattern (uniform) when other forensic evidence is unavailable or inconclusive. The answer lies in how one can measure the uniqueness of a uniform match – that is, given a qualitative observation of match by a forensic examiner, how many other uniforms will yield the same match?

While finding unique matches for most garments typically depends on visible differences (e.g., wear-marks or manufacturing imperfections), camouflage uniforms are an exception. This is because (1) the portion of the pattern observed at a fixed point on a given garment is unlikely to be the same as the same point on another garment made from the same pattern, and (2) there is an adherence to a consistent specification and a relatively standardized process for manufacturing. These factors enable the creation of a statistical model of all significant sources of variation in the manufacture of a camouflage uniform garment. Hence, while the association of a camouflage garment to a surveillance image may not preclude the *possibility* of an accidental association, the *probability* of an accidental association can be quantified objectively.

The probability of an accidental match is computed by statistically modeling the portion of camouflage pattern that is visible at any point on the uniform, and finding all distinct portions of the pattern that are qualitatively similar. Some parameters of the statistical model are measured directly, whereas others can only be estimated. In the interest of

computing a probability that is sufficiently robust to be presented as evidence, a conservative upper-bound is applied for every parameter that cannot be reliably measured. Hence the true probability of an accidental match is guaranteed to be lower than the bound computed by the statistical model. The model is general and can be applied to any camouflage uniform and can be expanded to other types of patterned or camouflage garments. Furthermore, the model allows the forensic examiner to input relevant information about the context of the investigation. For example, if it is known that all the camouflage garments in the vicinity were sourced from a single manufacturer, then the probability of an accidental association is greater than if the garments were sourced from many different manufacturers.

In this presentation, an overview of a year long research study on the statistical individualization of camouflage patterns will be provided. The research shows that a qualitative match of a military camouflage uniform, specifically the Army Combat Uniform (ACU), can be quantitatively assessed via an estimate of probability of accidental match. The presentation will describe the research (including visits to uniform manufacturers) and outcomes, and specifically will focus on a software tool that has been created to assist forensic investigators (the Military Uniform Uniqueness Statistical Evaluator – MUUSE). The tool provides forensic investigators a way to easily and accurately perform this analysis and generate reports suitable for use in legal proceedings.

This work is a major, unique contribution to the area of garment matching for forensic purposes, and will strengthen uniform matching evidence in future cases.

Digital Evidence, Camouflage Pattern, Photographic Comparison

D83 Considerations for the Forensic Authentication of Digital Audio Recordings

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After attending this presentation, participants will have learned about the differences in the approaches to the forensic authentication of analog and digital audio recordings. Common analyses and those unique to each will be discussed, and special considerations related to the analysis of digital recordings will be introduced.

This presentation will impact the forensic science community by providing a framework for the formal development of a methodology with regard to the forensic authentication of digital audio recordings. Such a methodology will directly assist examiners in the field.

The methodology for the forensic authentication of analog audio recordings is well-established in the field, most notably through the 1974 report regarding the examination of the Nixon tapes by the Advisory Panel on White House tapes and “Authentication of Forensic Audio Recordings” (Koenig) published in the *Journal of the Audio Engineering Society* in 1990. These documents provide detailed descriptions of the various analyses employed by government and private forensic examiners when authenticating analog recordings. The analyses which form the core of the examination include physical inspection, critical listening, high-resolution waveform, magnetic development, narrow-band spectrum, spectrographic, and other related scientific analyses.

With the proliferation of digital audio recordings in law enforcement investigations and consumer activities, these analog authentication methodologies and analyses need to be revisited, updated, and modified, as appropriate. Digital audio recordings can be stored on a wide variety of media (CD, DVD, fixed memory, memory cards, digital tape, etc.) and can be in a standard or proprietary format, with each combination of media and format bringing with it unique challenges for playback and analysis.

While most of the techniques employed in the authentication of analog recordings are also applicable to digital recordings, magnetic development may negatively impact digital recordings or may provide no

meaningful data, depending on the media containing the recording. Magnetic development is crucial to the authentication of analog recordings, as it assists the examiner in visualizing the magnetic patterns of the information recorded on the analog tape. However, with digital recordings, such examinations are meaningless with non-magnetic digital media (CDs, memory cards, etc.); may potentially render some forms of magnetic digital media (DAT, NT-2, etc.) unreadable, in part or in whole; and even when applied in a non-destructive way to magnetic digital media, may provide no useful information to the examiner.

Conversely, some digital recordings offer new forms of analyses which have no direct corollary in analog recordings. Metadata contained within a digital audio file, for example, may provide information above and beyond the audio data itself, which can be useful when determining time/date information, recorder information, and other administrative characteristics related to the recording. Additionally, mathematical algorithms which produce a “unique” value (generally referred to as “checksum” or “hash” values) based on the size and/or contents of the file may also be incorporated into the metadata and may directly determine if changes have been made to the audio data.

Deciphering and/or obtaining information about the structure and encoding of the metadata and audio data itself may be difficult or impossible, especially with the increase in the number of digital audio recorders employing proprietary file formats. In situations where this information (the non-standard structure of a digital audio file) cannot be determined, attempts are made by the examiner to decode the file structure through detailed data analysis techniques and exemplar recordings produced on the original recorder or a similar model recorder, if possible.

Because of the wide variety of physical media/format possibilities and the intricacies of various digital file formats, published research related to the forensic considerations of individual media, file formats (standard and proprietary), the applicability of the various “analog” analyses to digital recordings, and the development of new analysis techniques becomes even more critical for the establishment of a formal methodology.

Digital, Audio, Authenticity

D84 Using Automated Digital Tools for Forensic Audio Examinations

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The goal of this presentation is to provide testing results and guidance regarding automated audio analysis tools for use in forensic digital audio examinations.

This presentation will impact the forensic science community by increasing awareness of the benefits and cautions when using automated digital tools for forensic audio examinations.

Current technology offers a continually changing array of tools for forensic audio examinations. There has been significant progress in the design and usefulness of the tools available to the audio examiner in recent years. Traditionally, the forensic audio examiner had limited choices for electronic filters and other tools for forensic use. However, today there is a wide array of systems and tools to use for audio enhancement, duplication, voice comparison, signal analysis, and authentication examinations. This analysis investigates a variety of those audio tools and functions that are in common use. Particular emphasis is placed on analysis tools that improve the efficiency and effectiveness of examinations for the audio examiner. Some of the functions evaluated are noise removal, phase detection, prior digitization, tone-detection, statistics and batch processing. Functions related to computer forensics, for example hashing and file comparison, are not covered in this analysis. The primary focus for this analysis is the testing and review of tools for use in audio enhancement, signal analysis and authenticity examinations. There is widespread use of

digital audio analysis tools for these examinations, but there is very little measurable data for the examiner to judge the value of these tools. This analysis provides test results and recommendations concerning possible improvements in the speed and accuracy of audio examinations when using automated digital tools. Cautions are also provided to the examiner concerning certain technical limitations when using automated digital audio tools.

Some of the test results reveal inconsistent data and inappropriate application of technology. However, some of the systems performed well and clearly provide improved effectiveness and efficiency for certain forensic audio examinations. The function “phase detection” was tested and analyzed. Its test results show that inconsistent data occurs and can be misinterpreted. For example, a test recording with a minimum of ten stop/start recording events was tested with one of the phase detection systems. The goal of the system under test was to automatically detect possible alteration of recorded events, for example recording stop/start events. This automated analysis function would be used in an audio authenticity examination to determine among other details whether or not the recording was original, continuous and unaltered. The system under test concluded that “no phase changes nor alterations” were present on the test recording. Therefore, using that system for conducting an authenticity examination would be flawed. There are other alternative tools that provide effective results for detecting alterations in digital audio files. Another system was tested for its ability to conduct batch processing for the enhancement of an audio recording. The benefits of this function include improved efficiency and effectiveness, particularly for longer recordings exceeding an hour in length. This particular system depended on setting its filter parameters in the first few seconds of the recording. This meant that the enhanced version had no filtering effects for the first few seconds of the recording and the filtering was only effective after the parameters were ‘learned’ by the system. The system design for this type of batch processing would be considered not appropriate for forensic audio enhancement examinations.

Testing results indicate that the forensic audio examiner must be aware of the technical limitations of digital audio tools before using in actual examinations. In addition, all forensic tools should complete a series of validation tests to determine whether the tool is appropriate and whether the analysis results of the tool are accurate.

Audio Analysis, Digital Audio, Audio Authenticity

D85 Comparison of Methods of Performing Body Height Measurements in Images

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The goal of this presentation is to compare the performance of two separate methods of performing body height measurements in images.

This presentation will impact the forensic science community and/or humanity by presenting two methods of performing body height measurements in images.

With the growing number of security cameras in the public and private domain, more and more incidents are recorded. In forensic practice, facial comparison of perpetrator to suspects is not always possible, the quality of the images being too poor or the face of the perpetrator not being visible. In these cases it may nonetheless be possible to do an estimation of the body height of the perpetrator. The results can be used to exclude or gather evidence against suspects and as such are interesting to police, judges and lawyers.

In the literature, two methods for doing height measurements in camera images are predominant, both based on photogrammetry (literally: measuring in photographs).

When some a priori knowledge of the scene is available, height measurements can be done on a single image, without the need of camera calibration. Essential for height measurement by *single view metrology* are a reference height of an object in the scene, a set of vertical parallel lines and two sets of horizontal parallel lines (in different directions.) The analysis is based on projective geometry, through the use of so-called *vanishing points*. Together with a reference height, these make it possible to compute a height on the image.

The second method of doing height measurements in images is through the construction of a 3D model of the crime scene, by means of as an example either photogrammetric software or a laser scan. Operators link scene points of the 3D model to corresponding points in the questioned image, which makes it possible to determine position, rotation and focal length of the camera taking the images (“camera match”). Using the retrieved camera information, a virtual camera is placed in the 3D model of the room, looking at the model from the same perspective as the real camera at the real crime scene, and height measurements in the image are performed by placement of cylinders or bipeds (3D models of humans) over questioned persons.

For both of the methods, results need to be validated by doing reconstructions, positioning persons of known height in front of the same camera, under identical circumstances so that comparable reference measurements can be made.

For any height measurement of an operator on a donor, the difference between actual and measured height is assumed to have a normal distribution with a certain systematic bias and variance, both unknown.

Systematic biases result from:

- Loss in height because of the pose of the donor, and
- Inaccuracy of the 3D model and the camera match.

Non-systematic bias of the differences is due to random variation mainly because of human interference (operator effects). On the basis of the readings from the reconstruction, the systematic and random error made in measurements is then modeled and confidence intervals for the questioned person’s height can be determined.

Comparison of methods takes place by checking:

1. Consistency of the results and
2. Width of the confidence intervals.

The investigation comprises comparison of the methods in a casework example in which four perpetrators stood in front of two cameras.

Body Height Estimation, Photogrammetry, Validation



D1 Pattern of Police Torture in Pakistan

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After attending this presentation, attendees will understand the originality of police torture in third world and developing countries.

This presentation will impact the forensic community and/or humanity by demonstrating the results of research work by forensic scientists from various developed and developing countries. It has been observed that there exist significant differences between countries regarding circumstances, torture methods, and sequel to torture. This knowledge is of value to forensic specialists documenting alleged torture and essential for fair and valid forensic statements.

Following the September 2001 terrorist attacks on the United States, much support for torture interrogation of terrorists has emerged in the public forum, largely based on the “ticking bomb” scenario. The counterargument, of course, is that in a society destroyed by terrorism there will be nothing to repair. That is why the actual causal mechanism of torture interrogation in curtailing terrorism must be elucidated rather than presumed.

A study of 1820 victims of alleged police torture was examined at the office of Surgeon Medico legal Punjab Lahore during a period of 5 years. Most of the victims at the time of examination were showing visible evidence of physical trauma. Victims were mainly males, ranging between the ages of 15 – 29 years (61%). The poor labor class form rural areas were shown more violence by police and agencies. Examination was conducted on the directions of various courts (Judicial Magistrates, District & Session Judges, and Lahore high court). A wide range of different types of injuries of different durations were observed on various parts of the body. Blunt trauma was most frequent and the most common weapon used was the big flat oil dipped slipper. Psychological element of torture was also seen in some victims. Sexual trauma to females and child abuse was observed in a number of cases; such harassment was a hallmark of Political victimization.

Police, Torture, Victim

D2 Suicide at the Work Place

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The goal of this presentation is to focus on suicide at the workplace, to try to know any specificity about this kind of suicide, to understand the role of the job in the act of suicide, and to list if the suicide at the workplace was recognize as work injury.

This presentation will impact the forensic community and/or humanity by demonstrating the impact of the job in this kind of suicide and raising awareness about this problem of suicide at the workplace, and the recognition of work injury and the role of the job.

Introduction: In 2000, The French national institute of statistic (INSEE) recorded 10,832 deaths caused by suicide; it was 2% of the total death cases in France. Suicide is the number one cause of death within the young French people.

The so called “job related” suicide is very often difficult to establish because of determining which causes are truly work related. Regarding this topic, very few data are available and the literature is most likely referring to “death at the workplace.” Besides, this kind of suicide can be identified as work injury. In this case, the victim’s family can expect to receive compensation from the Social Security. The goal of this study was to list all the “workplace suicide” cases that occurred in the northern part of France and also to collect and analyze the data.

Materials and methods: It was a retrospective study based on the archives of the Lille institute of forensic medicine and forensic unities, but also on personal archives of the coroner of Lille and Dunkerque. Twenty-two cases were recorded from Jan 1, 1997 to Mar 31, 2005. Autopsy and scene reports were used in addition to the data. The following criteria were selected: Sex, age, time of death, professional background, autopsy or not, toxic ingestion, psychiatrics antecedent or previous suicide attempts (mode of suicide, personal or professional circumstances), explanatory document and the eventual work injury reports.

Regarding the professional background, the professional category (wordlist of INSEE), the company activity (CITI 2 V3 wordlist), and the victim’s job description (CITP 88 wordlist) were used. All reported work incident within the period were requested from the Social Security.

Results: Twenty-two files were selected (19 in Lille, 3 in Dunkerque, 1 in Douai).

All victims were men. Most of the victims were aged 40 to 50; the youngest and the oldest individuals being 25 and 58 respectively. Most of these suicides do not occur during regular working hours (9:00am – 6:00pm). These suicides are most likely to happen early in the morning or very late in the night. From a performance stand point, low qualified employees represent more than 50% of the recorded cases of samples. On an activity type stand point, most of the victims worked in the service or manufacturing industry. Ten out of 12 autopsied victims were qualified as clear suicide cases.

There is unfortunately a lot of missing data: Among 10 clearly identified suicide cases, it appeared that seven had psychiatric issues antecedent and that seven never attempted to end their life. Regarding any toxic ingestion history, 13 cases did not show any data, three were confirmed and six were negative. Mechanism of death was also listed in the data base: hanging seemed to be the most commonly used way to commit suicide.

Suicide causes clearly related to the job environment were rarely positively mentioned. At the opposite, personal issues were easier to identify: seven cases out of a selection of 13 clearly stated the personal issues factor as the suicide root cause.

Discussion: Despite the very few data available, this study allowed for a reflection on the job related suicide topic in the northern part of France. The lack of data can be explained by a very decentralized forensic organization (until the year 2000) in this part of the country. Moreover, suicide at the workplace remains a epiphenomena and the forensic department is not always involved in these very cases.

Clearly established suicide cases were selected in this study; attempts were ignored because of the lack of reliability of the data base. The absence of valid and available information is due to the fact that the coroner focuses most of the time on the investigation part of the suicide case to the prejudice of the autopsy. Nevertheless, it is possible to conclude on some epidemiological characteristics: 30 to 40 year old men seem to be the most affected group. Overall, men appear to be the majority of the suicide cases with a victim’s age average of 44.6.

As mentioned above, most of this kind of suicide do not occur during the regular working hours and are most of the time related to the

service and manufacturing industries. In addition, like mentioned in prior studies and reports, low qualified workers are predominant in the number of the so called work related suicides.

Unfortunately, the worker seniority could not be selected when psychiatric antecedents were commonly listed. Personal issues were often identified. It was not possible to really identify the professional environment and the personal background as root causes of the suicide.

Finally, it was noted that, as mentioned in most prior studies, that the most common way of suicide was hanging. A job related factor was identified through this study in some suicide cases. That's why a "job related" document was added in the forensic report.

Suicide, Work Accidents, Workplace

D3 Spontaneous Human Combustion (SHC): This Incomprehensible Phenomenon Refuses to Die

Alain Miras, MD, PhD, and Sophie Gromb, MD, PhD, Institute of Forensic Science, Groupe Pellegrin - Place Amelie Raba-Leon, Bordeaux, 33000, France*

After attending this presentation, attendees will learn of the existence of this curious phenomenon and the possibility of spontaneous release of fire under particular conditions.

This presentation will impact the forensic community and/or humanity by demonstrating not all fires obligatorily require a criminal, suspect or involuntary intervention of a human.

Several cases of human combustion, the cause of which was not evident, have been described over the last few centuries. These cases pose two kinds of enigmas. First, although the body is consumed, the immediate surroundings are left almost fully intact. Second, there is often no visible source of heat that might have started the fire. Furthermore, one is struck by the fact that the bodies are not completely consumed, certain parts being perfectly preserved, next to others that are reduced to a state of ashes.

Several hypotheses have been advanced over the years, the earliest of which seem ludicrous today. The authors review all these theories culminating with the most recent, scientific hypothesis based on experimental findings. They consist of alcohol, overage amount of fat and the "candle effect". Even though certain such deaths do not have fully satisfying explanations, medicolegal experts should be well aware of this phenomenon as it can have vital importance in cases that may involve homicide made to look like an accident or a suicide.

Spontaneous Human Combustion, Candle Effect, Fat

D4 Autopsy, Medical Examiner/Coroner System, and Decedent Characteristics: 1979-94 and 2003-04

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After attending this presentation, attendees will learn current autopsy performance prevalence, variance according to types of state medical examiner/coroner systems and decedent characteristics, and how patterns have changed over time.

This presentation will impact the forensic community and/or humanity by providing recent data on autopsy performance trends in the United States, a key indicator that has not been available since 1994. The elimination of the item in 1995 was criticized in a letter to the editor of JAMA (Hanzlick, National Autopsy Data Dropped, JAMA, vol. 280,

p. 886) as a problem for performance measurement, compliance, and national data analysis. The reinstatement of the item rectifies this.

Purpose: The purpose of this study was to examine 1) whether the percentage of deaths that were autopsied varied by medical examiner/coroner system, 2) whether the underlying cause of death among autopsied decedents varied by medical examiner/coroner system, 3) whether the characteristics of the decedents that were autopsied changed over time.

Methods: The study variables were drawn from death certificate data for the United States. Variables that were selected from the death certificate for the study were: if an autopsy was performed, age, race, sex, cause of death and the place of death. Percentages, ranking procedures, and statistical modeling were used to present the data and to describe the temporal trend.

Results: There was a decreasing trend for the performance of autopsy in the United States from 1979 to 2004. The percentage of deaths that were autopsied was higher in States with mixed medical examiner/coroner (me/c) systems than in States with coroner systems or medical examiner systems. The percentage of deaths that were autopsied was the highest for homicide (98.6%), SIDS (98.5%), and other external causes (79.5%) across all types of me/c systems. Being young, nonwhite, male, dying in the emergency room or dead on arrival also were associated with higher levels of being autopsied. Some of these characteristics reflect differences among subgroups in age and circumstances surrounding death.

Conclusion: Over the years, there is common ground in which deaths have an autopsy performed across types of me/c systems with homicide deaths most likely to be autopsied. Despite the value of autopsies, there is a decreasing trend in autopsy performance. The implication of the study results will be discussed.

Autopsy, Death Certificate, National Vital Statistics System

D5 Analysis of Patterns of Unnatural Deaths in Females Reported at Tertiary Care Hospital and Medical College in Eastern Nepal

Neha Malla, MBBS, Bishwanath Yadav, MD, and Chandra Bhal Tripathi, MD, B.P. Koirala Institute of Health Sciences, Department of Forensic Medicine, Dharan, Sunsari 56700, Nepal*

After attending this presentation, attendees will understand that violence against women is a universal reality. It is one of the important causes of morbidity and mortality in women. Violence against women has the greatest impact in South Asian countries, especially Nepal, where social and cultural norms seem to have accentuated the problem. It has major impact on the physical, social, and psychological health of women, leading to fatal outcomes like suicides and homicides. Though it's an important problem in society, little study has been conducted in this field.

This presentation will impact the forensic community and/or humanity by giving a glimpse of the existing problem of unnatural deaths in females in a developing country in South East Asia. The forensic community will have better knowledge of the problem, and can improve record keeping for assessment and better analysis of unnatural deaths in females. This would not only aid in justice, but would also help to mitigate the situation.

A retrospective study to assess the incidence and patterns on unnatural female deaths in 2062 B.S (April 2005-April 2006 A.D) was conducted at a tertiary care teaching hospital in Eastern Nepal. The study revealed that 87 cases of female unnatural deaths were reported out of 283 total autopsies conducted. The most common age group involved was 11-30 years of age (51.6%). Suicides were the most common cause of death (52.8%) followed by accidental deaths (40.22%)

then homicides (6.8%). Homicidal cases were likely to be under reported. Poisoning was the most common method of suicidal deaths (56.52%). More than half (52%) of women who committed suicide were married. Most suicide cases belonged to major hill, hill native and Terai middle and occupational group. Violence against women is one of the major problems of South Asian countries which can be decreased by promotion of women's issues awareness and education, for which proper data on female unnatural deaths is very essential.

Violence Against Women, Unnatural Deaths, Suicides

D6 Improved Weapons and Wound Patterns

Steven H. Brumm, MS, and Lorne L. Brooks*, Division of Public Safety Gulf Coast Community College, 5230 West Highway 98, Panama City, FL 32401*

After attending this presentation, attendees will understand how improvised weapons create unusual wound patterns.

This presentation will impact the forensic community and/or humanity by alerting investigators that unusual wound patterns may be caused by improvised weapons especially in a prison or jail setting.

Prison and jail populations, like all other societies today, are troubled by violent crimes. Inmates look to the correctional officers to protect them from violence but, as in cities today, the officers can't be everywhere at once and crime does occur. To protect themselves or to be able to carry out crimes of violence, inmates are very adept at improvising weapons from almost any material available to them. These weapons take many forms and tend to leave wound patterns that are different from those normally seen by investigating officers and Medical Examiners. The purpose of this presentation is to familiarize the attendee with some of the more common improvised weapons found in prisons and the wound patterns that they cause.

The one thing that inmates have is time. They have time to think of how to convert common things to weapons and they have hours to carry out their plans. An inmate who comes into possession of a suitable piece of plastic or metal thinks nothing of spending hours rubbing it against concrete to produce a sharp edge. Most weapons are defensive in nature. However, some are designed for offensive use and tend to be much stronger and often larger than defensive weapons. In general, once an inmate has made a weapon, he will conceal it in a public area so that if it is found by correctional officers, it can't be attributed to a specific inmate. However, some items can be concealed in plain view. For instance, a bar of soap in a sock makes a devastating impact weapon that can be instantly disassembled into two items the inmate is authorized to have. By the same token, a magazine rolled into a very tight cone can cause a fatal stab wound. Improvised weapons tend to fall into three major categories: impact, slicing, and stabbing. Each of these types of weapon produces a wound that is significantly different than the average knife or impact wound.

Over the years, the authors have collected a number of actual improvised weapons confiscated from inmates. There have been no modifications made to the weapons used in this presentation. The authors simply took the weapons and used them in their intended manner against a block of modeling clay. This produced patterns on and in the clay which would be very similar to wound patterns that might be observed by an investigating officer or medical examiner.

As expected, the weapons designed to slice or cut made impressions very much like a razor blade or box cutter. The impact weapons and the weapons designed to stab, however, produced impressions that were unique and unusual.

This presentation is designed to encourage investigators and medical examiners to think outside the box when they see an unusual wound pattern, particularly if the wound was produced in an area where there might be inmates or ex-inmates.

Improved Weapons, Wound Patterns, Prisons

D7 Drowned at Sea: Identification of a Sailor From the USS Gherardi Fifty-Two Years Later

Craig W. King, BS, William C. Rodriguez, PhD, Carna E. Meyer, MSFS, Demris Lee, MSFS, and Louis Finelli, DO, Armed Forces DNA ID Lab, 1413 Research Boulevard, Building 101, Rockville, MD 20850*

After attending this presentation, attendees will have a better understanding of the usefulness of modern forensic science methodologies in identifying historic remains. Attendees will bear witness to a tragic naval event through extensive historical photos and recent forensic findings which solved a fifty-two year old mystery.

This presentation will impact the forensic community and/or humanity by providing knowledge and resolution of a historic case utilizing two scientific disciplines.

On a stormy night just after midnight on December 2, 1942, two whaleboats were returning 34 sailors from liberty. One whaleboat successfully made the four mile journey back to the destroyer, USS Gherardi. The other would meet tragedy. In the middle of the storm that threatened the USS Gherardi herself, the second whaleboat was capsized by successive waves. Only two of the seventeen sailors survived the night amid the storm and icy waters of Narragansett Bay, Rhode Island. In the morning, five bodies that had washed ashore during the night were recovered along with the two survivors. Over the next several months, seven additional bodies were recovered and identified leaving only three men unaccounted for.

In August of 1943, fishermen recovered the partial remains of a body, which two naval medical officers determined was that of a naval enlisted man associated with the USS Gherardi loss. Positive identification could not be made at that time due to the decomposed and incomplete state of the body. The remains of the sailor were buried in an unmarked grave in Island Cemetery, Newport, Rhode Island, where they became forgotten over the next fifty-two years. In 1995 a retired Marine, Mr. Ted Darcy, was conducting an unrelated historical survey of Island Cemetery when he came across a gap in the grave plots. Mr. Darcy's continued investigation revealed that the unmarked grave plot contained the remains of an unknown sailor associated with the USS Gherardi tragedy. Over the next ten years Mr. Darcy obtained a memorial marker for the grave, and was able to locate direct relatives of the three unaccounted for sailors.

The information obtained by Mr. Darcy was forwarded to the U.S. Navy for verification. Upon verification, the Navy exhumed the remains in the spring of 2006 for the purpose of renewed identification efforts based on modern scientific analyses. Forensic anthropological examination of the remains by the Armed Forces Medical Examiner System (AFMES), revealed them to be most consistent with the biological profile reported for the youngest sailor in question, Seaman First Class Raymond S. Johnson. A section of bone was removed from one of the femurs and submitted to the Armed Forces DNA Identification Laboratory (AFDIL), for mitochondrial DNA testing.

Blood samples from the maternal relatives of the three unaccounted sailors were processed for the entire Control Region. The bone sample was organically extracted which yielded high quality results utilizing Primer Sets. The results of the skeletal sample showed concordance with the maternal relative of Seaman First Class Raymond S. Johnson within the targeted region with the exception of a heteroplasmic at position 152, while excluding the other two family references. As result of the DNA and forensic anthropological analyses, the remains were identified as Seaman First Class Raymond S. Johnson, putting to rest a fifty-two-year-old mystery.

Mitochondrial DNA Analysis, Historic Remains, Anthropology

D8 A Comparative Analysis of the Public Health Role of Death Investigation Systems

Stacy A. Drake, MSN, RN, Memorial Hermann Healthcare System, 6411 Fannin Street, Houston, TX 77030; Mary desVignes-Kendrick, MD, MPH, University of Texas Health Science Center School of Public Health, 1200 Herman Pressler, Houston, TX 77030; and Dwayne A. Wolf, MD, PhD, and Luis A. Sanchez, MD, Harris County Medical Examiner Office, 1885 Old Spanish Trail, Houston, TX 77054*

The goal of this presentation is to educate the forensic community about various public health roles played by death investigation systems in a diverse state practicing under a single medical examiner law in which death investigation is politically separate and distinct from state and local Public Health Departments.

This presentation will impact the forensic community and/or humanity by demonstrating preliminary results suggesting that the role of medical examiner/coroners in public health is more extensive than is widely recognized. Further, it appears that the instrument that has been developed to assess this role will be useful and applicable. Finally, mutual education of death investigators and public health officials of their respective roles will better serve the local community.

Public health is a broad term used to describe a system that takes an interdisciplinary approach to identify and prevent, promote and protect the safety of citizens within a community. Public health, similar to death investigation, is linked to governmental and political decision makers. The hypothesis underlying the current research is that death investigation is, in fact a public health function, regardless of the political alliance, or lack thereof, between the official entities. Conversely, public health departments rely heavily on data provided by medical examiner/coroners in order to assess, implement, and evaluate programs within communities. This reliance is widely recognized, although public health departments frequently do not understand the role of death investigators, and hence do not understand the limitations of the data thus derived. Regardless of political alliance, recognition of the mutually dependent roles and overlapping functions between these entities will serve the greater good of the community.

The ten essential roles of public health will be explored in depth throughout the presentation. In order to conduct this analysis, a standardized questionnaire addressing each of these roles was derived from the National Public Health Performance Standards, published by the federal Department of Health and Human Services. Specifically, questions were extracted from the Local Public Health System Performance Assessment Instrument component. Initial development and testing of this instrument involved face-to-face meetings with the local medical examiner (Harris County, Texas). Subsequently, questions were edited, revised, and amended to clarify their relevance to death investigation. Questionnaires were then mailed out to a representative sample of medical examiners and justices of the peace (equivalent to an elected coroner within this state) within Texas. Phone calls were implemented where necessary for clarification of specific points.

Initial findings were both expected and unexpected. It is widely known, for example that the local medical examiner (Harris County) plays an active role in child fatality reviews, disaster planning and in local trauma service morbidity/mortality conferences. The local medical examiner office also plays an active role in injury/violence prevention programs. An unexpected finding was that regulatory oversight of medical examiner offices and death investigation systems in this state are voluntary. Survey results will demonstrate a wide variability in the actual involvement in public health roles, and an even wider self-awareness of this involvement.

Our preliminary results suggest that the role of medical examiner/coroners in public health is more extensive than is widely recognized. Further, it appears that the instrument that has been

developed to assess this role will be useful and applicable. Mutual education of death investigators and public health officials of their respective roles will better serve the local community.

Death Investigation System, Public Health, Medical Examiner

D9 Utilizing Ultrasound Technology to Measure Facial Tissue Thickness in Canadian Aboriginal Populations

Tanya R. Peckmann, PhD, Saint Mary's University, Department of Anthropology, McNally South 208, 923 Robie Street, Halifax, Nova Scotia B3H 3C3, Canada*

After attending this presentation, attendees will have a better understanding of the data required for creating 3-D facial reconstructions; understand the need for utilizing facial tissue depths standards valid for a specific population of origin - presently, no data exist for facial tissue thickness in Canadian Aboriginal populations; and understand the methods employed for measuring tissue facial depth measurements.

This presentation will impact the forensic community and/or humanity by aiding in positive identifications for unknown skulls from peoples of indigenous ancestry.

1. This is ground breaking research and has never been published previously.
2. This new data can be utilized by law enforcement for creating more accurate pictures of what a missing child may look like today, years after they have disappeared.
3. This new data will aid in positive identifications for unknown skulls from peoples of indigenous ancestry.
4. This project will allow a new and positive connection to be made between Canadian First Nation communities and scientists.
5. As students will be trained to help use the ultrasound machine, this project will initiate proactive education and career-related training programs.

In forensic cases, when no identification is possible, facial reconstruction can aid in establishing an individual's identity. The purpose of this research is to add to the already existing databases of children and adults for use in 3-D facial reconstructions of unknown or missing individuals. When facial reconstruction is attempted, it is critical that the measurements utilized for facial tissue depths are standards valid for a specific population of origin.

Not all children grow at a similar rate and therefore it is difficult to establish methods that can be universally applied to predict the growth of children's faces. However, the most accurate growth prediction is likely to occur when large reference groups, similar to the population studied, are utilized to derive standard values. Since children of indigenous ethnicities are underrepresented in the published data for tissue depth thicknesses, this project provides additional methods for establishing the identity of unknown human child skeletons. This new data can also be utilized by the police department for creating pictures of what a missing child may look like today, years after they have disappeared.

Accurate measurements for facial tissue depth are an important and vital tool inside and outside of the medicolegal arena. In forensic contexts, this new data will aid in positive identifications for unknown skulls from peoples of indigenous ancestry. For the police, who are searching for a missing child, employing this new data may help a family reunite with their lost child. For traditional peoples, this new knowledge will give voice to a once forgotten group of peoples.

Forensic Anthropology, Facial Reconstruction, Indigenous Peoples

D10 A Further Attempt to Identify the Unidentified: The Resolve Initiative

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After attending this presentation, attendees will gain an understanding of the process for establishing a website to assist with identifying decedents where other methods have proven unsuccessful. The attendee will also gain an understanding of the value of using the internet for these difficult identification cases.

This presentation will impact the forensic community and/or humanity by increasing appreciation of how a website can assist with identifying bodies and remains where other methods have failed. The forensic community will also better understand how information can be provided on a public website in a sensitive and respectful manner.

The Office of the Chief Coroner (OCC) Ontario and the Ontario Provincial Police (OPP) unveiled a new website in May 2006 in an effort to help resolve cases of unidentified bodies/remains. This new website, accessed through www.opp.ca and entitled "THE RESOLVE INITIATIVE," contains information about both missing persons reported to the OPP (in which foul play cannot be ruled out), as well as unidentified bodies/remains cases, for the Province of Ontario (population 12 million).

Since 1975, there have been more than 150 cases in Ontario where, despite all efforts, the OCC has been unable to identify bodies or human remains. When more traditional methods have failed, some other jurisdictions have recently started to provide information on the internet, as one additional strategy to help identify these cases. The use of the internet has proven to be very effective, in large part due to the fact that the internet is widely used, available 24/7 and truly is "worldwide" – not limited to a province, state, country or even a continent.

Cases are included on the website when a decision has been made that other more traditional methods of identification have failed. Basic descriptive information is provided on all cases. Images are also presented when it has been determined that they may assist with identification. Where available, there are images of characteristic clothing, tattoos, or jewelry. In approximately 20% of cases, there are touched up photographs of the face taken at the time of autopsy. In ten cases of skeletal remains or badly decomposed bodies, there are artists' reconstructions, arising from cases where photographs are not helpful or inappropriate. In each and every case, significant efforts have been undertaken to ensure that the information and images are presented with sensitivity, out of respect for the deceased persons, their families and friends, and the public at large.

The goal of this new initiative is to provide the best information available on a public website, in as sensitive and respectful a manner as possible, to help identify persons when other methods have failed. During this presentation, four case scenarios will be highlighted from the website demonstrating the type of information that has been included. At the time of abstract submission, two cases have been identified as a direct result of this project.

Internet, Unidentified Bodies, Unidentified Remains

D11 The Final Round in Lane #14: Shooting Range Suicides

Erin E. Falconer, MFS, and Todd M. Luckasevic, DO*, Virginia Department of Health, Office of the Chief Medical Examiner, Northern District Office, 9797 Braddock Road, Suite 100, Fairfax, VA 22032

The goal of this presentation is to report the findings encountered in a case series of suicides that occurred at indoor shooting ranges in Fairfax County, Virginia.

This presentation will impact the forensic community and/or humanity by providing information on the findings associated with suicides that occurred at indoor shooting ranges with emphasis on the relative ease of renting a firearm, location and characteristics of the wound, caliber of the handgun, items rented at the range, presence of a suicide note, and history of mental illness or life event.

Introduction: Suicide is one of the most important public health issues in the United States. Suicide represents the eleventh leading cause of death in the United States. Nearly 20% of the caseload of the Northern Virginia Office of the Chief Medical Examiner in Fairfax, Virginia is suicide. Suicide rates for this country have been relatively stable over the past decade with approximately 11 per 100,000 population. The most common method of suicide in the United States is the use of a firearm. However, to purchase a firearm in Virginia, one must be of legal age, successfully pass a criminal background check, and be a resident of Virginia for at least 30 days with two forms of identification.

Materials and Methods: This is a retrospective review of case files from the Northern Virginia Office of the Chief Medical Examiner in Fairfax, Virginia. Inclusionary data for this case series included cause of death being a gunshot wound, manner of death ruled as suicide, and place of injury being an indoor shooting range. These cases were reviewed for the following information: the location and characteristics of the gunshot wound, the caliber of weapon, the items rented at the range, the number of shots fired down range, underlying psychiatric illness or life event, the presence of alcohol or other commonly abused drugs, the presence of a suicide note and/or past ideations/attempts, and the demographics of the decedent. The case information was organized into a spread sheet and the data was analyzed for any trends or other interesting correlations.

Results: During the year 2005, 230 suicides were investigated by the Northern Virginia Office of the Chief Medical Examiner. Of these 230 suicides, 84 (37%) were caused by shooting oneself with a handgun. There were three cases of gunshot wound suicides involving a handgun with the place of injury being at a shooting range. The three decedents were male and each comprised a different ethnicity. Ethanol was present in the postmortem toxicology sample of one the decedents. Another decedent had both opiates and benzodiazepines in his postmortem toxicology sample. Only one individual left a suicide note. The location of the gunshot wound was intraoral (2) and right temple (1). Two decedents rented a 44 magnum revolver and the other used a recently purchased 9mm semiautomatic handgun which he was not allowed to possess but could shoot while at the range. Other items rented at the range included: ammunition, targets, eye, and ear protection. The two decedent's shot themselves with the first round. There was no known or documented history of depression, psychiatric illness, or life event in two of the decedents.

Conclusions: This case series emphasized the role that indoor shooting ranges with rental firearms play in suicides of person who otherwise are unable to own/purchase a handgun. In the year 2005, three individuals committed suicide by shooting themselves in the head with a rented handgun while at a shooting range. One individual was not allowed to own a handgun, another individual had all his firearms recently confiscated by law enforcement, and the third had his handgun purchase pending for a background check.

Suicide, Handgun, Shoot Range

D12 Are There Differences Between Cause of Death Among College Student and Death Among Non-College Students of the Same age Group?

Carrie Costello, BA, Purdue University/Tippecanoe County Coroner's Office, 205 South Intramural Drive, West Lafayette, IN 47907*

After attending this presentation, attendees will be briefed on the eleven year statistical overview and information gained in this research of deaths of Purdue University students versus deaths of the same aged individuals occurring in Tippecanoe County. This information can be utilized in analyzing the cause and manner of deaths with the focus on the possible on individual's deaths attending a higher level of education versus those individuals who have not attended a college or university.

This presentation will impact the forensic community and/or humanity by demonstrating the differences between the causes of death individuals who attend a university/college and those, of the same age range, whom do not. This information can be utilized to adjust, improve, and/or implement programs to assist in decreasing the preventable deaths.

From January 1995 through July 2006, there have been 122 deaths of Purdue University students; 25 committing suicide, 19 deaths due to natural causes; 54 deaths due to automobile accidents, and 17 deaths either accidental or undetermined. Whereas, the death, of individuals between the ages of 18-30 who do not have any college/ university or higher level of education, occurring in Tippecanoe County total 153. Of those deaths, 32 committed suicide; 15 were homicides; 70 were due to traffic accidents, 17 were ruled natural causes and 26 were ruled either accidental or undetermined.

The most astounding and unexpected difference was the cause of deaths due to drug overdoses. There were only 2 deaths due to accidental drug overdoses in the individuals who attended Purdue University, whereas there were 30 deaths due to accidental drug overdose in the individuals who died in Tippecanoe County, Indiana who did not attend Purdue University.

With a deeper understanding of the deaths among individuals between the ages of 18-30, risk behaviors may be identified as well as other findings that may assist in reducing the preventable deaths of both those who attend Purdue University and those who have no higher level of education in their background.

Death, College Students, Purdue University

D13 Role of the Forensic Clinical Nurse Specialist in Public Health, for Bioterrorism and Disaster Response Training of Nursing Staff

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The goal of this presentation is to illustrate how the forensic background and experience of the (Forensic Clinical Nurse Specialist) FCNS is ideally suited to this emerging position within public health; To describe public health core competencies for public health workers; and to describe the role of the FCNS in a large, urban health department.

This presentation will impact the forensic community and/or humanity by expanding the role and skill sets of Public Health Nurses, RNs, LVN/LPNs, and auxiliary nursing staff, within the communities already served; enhancing community and Public Health readiness to respond for a variety of emergencies or disasters; and improving

capacity for teamwork between Public Health nursing staff and other first responders in a given community, in accordance with federal and CDC standards.

Communities look to local public health departments for guidance and recommendations in a myriad of health-related situations on a daily basis. The potential and actualization of both natural and man-made disasters have prompted public health nursing to expand its role into new borders and frontiers to better serve target communities. The general role of public health in emergencies is an extension of the general mission of public health, i.e., to promote physical and mental health and prevent disease, injury, and disability (*Public Health in America*). This paper will focus on the training of Public Health Nursing and other health promotion or allied nursing staff.

Depending on the type of disaster or emergency, the role of an individual public health agency may be that of a lead position, collaborative, or supportive in nature. Therefore, public health staff must be competent to carry out a diverse range of responsibilities. Public health employees are designated as disaster service workers. The Centers for Disease Control (CDC) has defined core competencies for public health workers. Increasingly, job descriptions and functional roles define and reference emergency responsibilities and tasks. Examples of core responsibilities include disease surveillance and outbreak investigation and follow-up. These require multidisciplinary, multiagency collaboration on a regular basis; the need becomes more pivotal in biological, environmental, and/or weather emergencies. Man-made and natural disasters, emerging infectious diseases, e.g., SARS, and potential pandemics, e.g., avian flu, predicate a need for all Public Health Nurses to incorporate disaster planning and response into their repertoire of clinical skill sets.

Traditional public health work, such as tuberculosis, sexually transmitted diseases (STDs), other communicable diseases, maternal-child nursing, and high-risk infant follow up, to name but a few, continue to require the knowledge and experience of the Public Health Nurse (PHN). Increasing fiscal limitations and consolidation of programs and resources have presented challenges to both administrators and staff. The events of the last 5 years has brought to the forefront the need for public health nursing staff to incorporate an additional role into their arsenal of skills, that of disaster response. In addition to more typical emergency response, PHNs need to understand biological and chemical agents, basic principles of weapons of mass destruction, and the national incident command system (NIMS). All public health employees need to know chain-of-command, emergency response plans, their functional role in an emergency response, how to utilize communication equipment, and communication channels. Staff need to be able to identify limits and resources, recognize deviations from normal that might indicate an emergent situation, and how to take appropriate action.

Public health nursing professionals need to be able to demonstrate their clinical readiness to respond via regular exercises and drills. They should be able to incorporate epidemiological surveillance, laboratory resources, science-based investigations, and risk-assessment into their preparedness skills. Some of the disease entities that PHNs study for bioterrorism and disaster preparedness include smallpox, anthrax, plague, tularemia, and pandemic flu.

Specific clinical skills can be taught and demonstrated regularly, to ensure competency is maintained. Examples of these skills include the use of personal protective equipment (PPE), the incident command systems (ICS), phlebotomy skills, vaccination techniques (mass vaccination scenarios), nasopharyngeal swab collection, and methods to administer mass prophylaxis of antibiotics. Some counties, like Santa Clara County, California, are collaborating to operationalize the concept of influenza care centers (ICCs), as a modality of care in the event of pandemic flu. Likewise, points-of-distribution (PODs) are being planned for mass antibiotic distribution to a large population within a short interval of time, e.g., in a weaponized anthrax event. Public Health Nursing would have a pivotal role in all these non-traditional venues.

The forensic background of the FCNS is one that includes multidisciplinary teamwork and collaboration on a regular basis, with members of law enforcement, the criminal justice system, emergency departments, and other first responders. Forensic nurses are experts in the principles and practice of chain-of-custody. They are accustomed to troubleshooting gaps in knowledge and experience and at creative problem solving to achieve pragmatic solutions that can be tailored for an individual "fit." Likewise, the forensic experience crosses all geographical boundaries, i.e., urban, rural, state, regional, national, and global.

Forensic investigations parallel the process of disease surveillance. Most forensic nurses are versed at working in highly stressful clinical situations; thus they understand the implications of catastrophic events on both staff and vulnerable populations. The forensic clinical nurse specialist should be able to draw on forensic experiences to plan and implement training modules, exercises and drills, and to develop *just-in-time training* for exigent situations. Moreover, as a nurse, the FCNS can identify with, and better employ, creative solutions to the training of public health nursing personnel.

Disaster Nursing, Forensic Nurse, Public Health Nursing

D14 Forensic Nursing Science in Sweden

Jonas Lindgren, BSN, RN, National Board of Forensic Medicine in Sweden, PO-Box 408, Gothenburg, 405 30, Sweden*

After attending this presentation, attendees will be able to understand some of the development of forensic nursing death investigation and the forensic nurse's impact of the death investigation in Sweden. The attendees will be able to identify how the nursing science is applied in the area of forensic medicine in Sweden. This presentation will bring understanding and knowledge to the attendees about the movement and development of forensic nursing globally. The presentation will focus on the system of death investigation in Sweden and how the nurses have worked their way into the system during the five years that nurses have worked in the field and also how the discipline of forensic nursing science is developing in Sweden.

This presentation will impact the forensic community and/or humanity by providing understanding of the Development of Forensic Nursing Globally.

The Forensic Nurse Death Investigators impact on the medicolegal death investigation - Nurses have not been involved in medicolegal death investigations before the year 2000 in Sweden. There are five fulltime forensic nurse death investigators (FNDI) in Sweden in 2006.

In Sweden, there are approximately 5500 medicolegal death investigations conducted every year and the five FNDI are involved in 35% of the cases. The role of the FNDI in the medicolegal death investigation is the most prevalent connection with the next of kin during the whole process and investigating the medico-psycho-social aspects of the dead person.

The FNDI contributes to the medicolegal death investigation by conducting a psychosocial autopsy of cases in which the forensic pathologist is requiring more information to determine the manner of death. The psychosocial autopsy is based on facts that are revealed from talking to next of kin, reading hospital records, and following up every small detail about the dead person that could bring more information to the case.

The need for Forensic Nurse Death Investigators in the future - The national board of forensic medicine (NBFM) has requested an oversight of the system of death investigation from the Swedish government. In that request, the NBFM suggests that the FNDI would do a psychosocial autopsy of every case of sudden and unexpected death in Sweden. The FNDI then present the outcome of the psychosocial

autopsy to the forensic pathologist in charge. Based on this information, the forensic pathologist in charge will decide whether there are enough clinical background to determine the cause of death or a forensic autopsy should be done.

If the system will be changed in the way that the NBFM is suggesting then 20 more FNDI will have to be employed.

The development of forensic nursing science in Sweden - Jonas Lindgren is the first doctoral student in Sweden within the area of forensic nursing. In his dissertation, he is studying the community network surrounding the next of kin that has lost a loved one in sudden unexpected death and what impact the FNDI have on the next of kin.

In autumn 2006 or spring 2007, the first 5 credit course in forensic nursing in Scandinavia will be held at the University of Gothenburg.

The awareness of forensic nursing science among Swedish nurses is growing every year and that is mostly because the FNDI is involved in the training and education of nurses and other professionals in the area.

Forensic Nursing, Globally, Death investigation

D15 The Role of Testing for *Chlamydia Trachomatis* When Examining Sexually Abused Children

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After attending this presentation, attendees will understand the importance of testing for sexually transmitted diseases, in this case *Chlamydia trachomatis*, when examining sexually abused children, even in cases with normal ano-genital findings and no symptoms of sexually transmitted diseases.

This presentation will impact the forensic community and/or humanity by demonstrating the relevance of discussing the methods of documenting sexual abuse. The presence of a positive *Chlamydia trachomatis* culture in a pre-pubertal child is a strong indicator of abuse, and may be an important evidential factor. Researchers wished to evaluate the tests for *Chlamydia trachomatis* and point out the relevance and importance of performing cultures when looking for *Chlamydia trachomatis* infections in pre-pubertal children.

At the Institute of Forensic Medicine, Department of Forensic Pathology and Clinical Forensic Medicine, Aarhus University, Denmark, medicolegal examinations of suspected sexually abused and assaulted children have been performed since 1995. The children are referred to the Institute by the police, and in a few cases by the local pediatric department. The institute serves an area of approximately 2.5 million inhabitants, which is close to half of the Danish population.

The medicolegal examinations are performed by forensic pathologists specially trained in clinical forensic medicine and are undertaken to document signs of sexual abuse. The examination includes a colposcopic examination of the ano-genital area when possible, documented by digital video recording. When indicated by history, tests for sexually transmitted diseases are included in the examination. If treatment is needed, the children are referred to their local pediatric departments or their general practitioner.

All cases with examinations of allegedly sexually abused children at the Institute from January 1st 1995 to July 15th 2006 were evaluated. In total 618 children in the age group 0-14 years had been examined and in 93 % of cases, colposcopy was used as a diagnostic tool. Until 2006, there had been no positive test results of *Chlamydia trachomatis* or *Neisseria gonorrhoeae*. The first positive test result came back in a case of a single incestuous incident of sexual abuse by the step-father of an, at the time of the assault, eight year old girl, that took place approximately two and a half years prior to the time of examination.

Vaginal penetration was described by the girl. The colposcopic examination revealed normal ano-genital findings. A culture obtained from the vaginal wall came back positive for *Chlamydia trachomatis*.

The results of these tests so far may indicate a need for a discussion of the indications used for testing for sexually transmitted diseases in children and the methods used in the examinations. It's important to consider why the prevalence in the examined material is so low. Cultured tests for *Chlamydia trachomatis* have so far been the only reliable tests, when the results are meant to serve as possible forensic evidence, because it is highly specific, and positive PCR tests should be verified with a test culture. But it is also a test that adds to the discomfort of the examination, and may be impossible to obtain, therefore reliable alternative test methods would be advantageous to the examination. It is important to do continuing testing for sexually transmitted diseases, even though the incidence in this specific population is low. When the tests come back positive, they may serve as an important evidential factor.

Child Sexual Abuse, Sexually Transmitted Diseases, Chlamydia Trachomatis

D16 Investigative Case Management for Missing Children Homicides

Katherine M. Brown, MA, Sam Houston State University, PO Box 2296, Huntsville, TX 77341-2296; Robert D. Keppel, PhD, Seattle University, PO Box 222000, 901-12th Avenue, Seattle, WA 98122-1090; Joseph Weis, DCrim, University of Washington, Department of Sociology, Seattle, WA 98195; and Marvin E. Skeen, BS, Washington State Attorney General's Office, HITS Investigator, MS TB 14, 900 Fourth Avenue, Suite 2000, Seattle, WA 98164-1012*

After attending this presentation, attendees will understand results from this study that will help police investigators to more timely and efficiently identify strategies and implement tactics that will lead to the capture of child abduction killers and the solutions of child abduction murder cases.

This presentation will impact the forensic community and/or humanity by demonstrating how very little information exists in social science literature about the victims of child abduction murder. This research will be used to improve the efficiency and effectiveness of the investigation processes of those murders.

The existing research on the rarity of child abduction murders, particularly those committed by non-family killers, shows clearly that most law enforcement jurisdictions in the United States will not be called on to investigate a child abduction murder. In fact, most homicide investigators will never investigate a child abduction murder over their entire career. However, it is prudent for investigators to be prepared. These investigations can put enormous strain on even the best prepared detectives, investigations, and jurisdictions. Their typically emotion-laden, volatile, high profile characteristics present unique challenges to law enforcement. This presentation will discuss the initial police involvement, the time frame within which an abducted child is killed and give an overview of the victims of child abduction murders.

Murder, Solvability, Child Abduction

D17 Nursing for a New Millennium — Forensic Nursing Course (NU 447): A Senior Nursing Baccalaureate Elective

Donna Garbacz-Bader, MSN, RN, and L. Sue Gabriel, RN, BSN, MFS*, BryanLGH College of Health Sciences, School of Nursing, 5035 Everett Street, Lincoln, NE 68506-1398*

After attending this presentation, attendees will be briefed on the tools necessary to develop an undergraduate forensic nursing course based on (2) credit hours of theory and (2) credit hours of comprehensive clinical activities.

This presentation will impact the forensic community and/or humanity by providing nurse and forensic science educators with a detailed curriculum format to develop an undergraduate Forensic Nursing Course with a full compliment of clinical experiences to correlate with nursing and forensic class theory and principles. The undergraduate forensic nursing course will provide the basic theory and principles of the forensic science process to that of the nursing process and allow for additional advanced forensic nursing training in forensic nursing graduate programs. This will provide the investigative team and the community with an additional knowledgeable and experienced member.

This course, the first complete (4) hour credit Forensic Nursing Course to be offered as a senior elective in a baccalaureate nursing program in the U.S., was developed as a result of increased awareness in the fields of forensic nursing and forensic science. This introductory course will concentrate on the application of forensic science theory to the nursing process with direct application to the provision of nursing care for the victim, family, society, and perpetrators of violent death and/or injury.

The course is based on forensic nursing as a subspecialty of nursing that includes the identification and treatment of victim injuries resulting from violence and trauma. It focuses on the role and responsibility of the forensic nurse with theory and concepts related to the:

1. Identification of injuries of abuse
2. Collection and preservation of medicolegal evidence
3. Initial treatment of injuries related to violence, abuse, and trauma
4. Death scene processing

Course examines the direct services provided by the forensic nurse to:

1. Individual clients
2. Consultation services to nursing, medical, law enforcement agencies
3. Court testimony in areas dealing with questioned death or violent trauma
4. Delivery of services and diagnoses of conditions as they relate to nursing

The presentation identifies the:

- Course Objectives
 - Course Placement
 - Prerequisite Courses
 - Credit Hours
 - Course Content
 - Teaching Strategies
 - Clinical Component
 - Professional Standards
-

Forensic Nursing, Forensic Nursing Undergraduate Nursing Course, Forensic Nursing Course Clinical Component

D18 Case Study: Insect Succession in Pig Carcasses in Two Regions of Japan Where U.S. Military is Present

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After attending this presentation, attendees will understand the use of entomology in determining of PMI and insect succession in two areas of Japan.

This presentation will impact the forensic community and/or humanity by helping to establish the succession of insects to remains in two different climates of Japan. The information collected will be used to help determine postmortem intervals and can be compared with similar climates in the United States.

A joint forensic entomology experiment was conducted to document insect succession in two regions of Japan where U.S. military troops are based. The experiment entailed documentation and sampling of adult and larval insects present on and around pig carcasses, and the rate of their development to assist in determination of postmortem interval. The results were then compared between the two U.S. military bases, approximately 40km apart: Yokosuka Naval Base and Yokota Air Base. This case study will provide U.S. law enforcement in Japan with information widely available in the United States on forensic entomology and estimates of postmortem interval, which is currently not available in Japan. Collection on the Yokosuka pig carcass (located in a humid, moist environment) produced three fly species, and at least six other insect species were collected in close proximity to the carcass. Collection on the Yokota pig carcass (located in a dry, arid climate) produced two fly species, and at least four other insect species were collected in close proximity to the carcass.

The pigs, both weighing approximately 95 pounds, were obtained from a local meat processing facility, and were transported to the research sites immediately after being sacrificed via blunt force trauma to the head. The carcasses were placed in metal mesh cages, enabling insects access to the carcasses, but preventing larger predators from consuming or tampering with the carcasses. Daily scene documentation, including humidity, soil temperature, and various body temperatures were collected from both pigs. Photographs and various samples, to include eggs, larva, adult, and soil, were collected daily from various places on and near the carcass. The Yokosuka pig was entirely covered by maggots by day #13 of the experiment and was fully desiccated and almost completely lacking in maggot activity on day #24. The experiment concluded after 39 days, when no insect activity was identified as present.

The Yokota pig exhibited more of the expected decomposition stages than the Yokosuka pig. The drier, more arid environment seemed to contribute to less immediate insect activity, and the pig carcass never reached the stage of full maggot coverage after 59 days, as seen on day #13 of the Yokosuka pig. The pig carcass experienced more normal stages of decomposition, vice complete consumption by insects, for the duration of the project which was ended after 60 days.

On the basis of these results, U.S. law enforcement in Japan should use caution in applying forensic entomology results from one region of Japan to another geographic region. The results indicate that even over short distances, the vast temperature and humidity disparities in Japan affect insect activity, decomposition, vegetation, and therefore,

consumption rates by carrion feeders. Based on this, more comprehensive research is necessary to conclusively identify trends and species in Japan's varying climates and regions. Due to international shipping restrictions prohibiting the shipment of live insects overseas, continued collaboration amongst U.S. law enforcement agencies in Japan is critical in cases involving forensic entomology evidence.

Insect, Postmortem Interval, Japan

D19 An Ancient Case of Spontaneous Human Combustion - Or Not!

Gareth W. Roberts, MSc, Bournemouth University, School of Conservation Sciences, Forensic Sciences Group, Room C140 Christchurch House, Fern Barrow, Poole, Dorset BH12 5BB, England*

After attending this presentation, attendees will gain a greater understanding for the need to carry out full and quantitative research supported by peer review and not allow those in authority to determine outcomes of a given case; and they will also learn that only the person making the examination, in full receipt of all the facts, can make a determination as to the origin and cause of a fatal fire.

This presentation will impact the forensic community and/or humanity by helping in the understanding of the importance of carrying out a thorough investigation and research into any given case regardless of what they are told by those in authority and that it is the Reporting Officer that will ultimately be responsible for the information contained in any report submitted to the Courts and not necessarily laboratory directors. Therefore, full, accurate, comprehensive, and unbiased reports are essential; and stimulating discussion between fire investigators and scientific staff on the subject of Spontaneous Human Combustion and does it actually exist as a scientific phenomenon?

This paper will discuss an ancient case of Spontaneous Human Combustion (SHC) occurring in rural England in 1613. In Southern England the Puritan faith had a grip on all aspects of local life. These priests preached repentance from sin, a Puritan faith, and compassion for other people. However, the obvious misery of so many people living in squalor and poverty seemed to be lost on them. During a particularly harsh period in the small town of Christchurch a fire occurred which resulted in the death of a local peasant. Despite witnesses to the incident, those in authority chose to listen to the local priest and as such, down through the ages the case was published in various articles as a case of Spontaneous Human Combustion. As the years passed the story became more embellished and accepted into local folklore. Extensive research has been carried out in relation to the incident and the structure in which the incident took place. Research has also explored how local superstitions can influence incidents of this nature. The reader will gain an understanding that not all published cases of "Spontaneous Human Combustion" are as they seem and that facts can be made to fit the case. This paper will discuss how ancient rights, superstitions and the views of those in power on the day have the ability to sway public opinion and change outcomes in order to suit their own needs. It will also demonstrate that simply constructed buildings of the day were no match for the natural elements. The conclusion of this case demonstrates that, with research, even the most simplistic of SHC cases can have an alternative ending and with due diligence and good research skills the writer can find better evidence to support a more scientific conclusion. Therefore, at the end of this presentation the reader has to be asked was this really a case of Spontaneous Human Combustion and does Spontaneous Human Combustion actually exist?

Fire, Ancient, SHC

D20 Cartridge Case Class Characteristics of Rotating Multi-Barrel Firearm: The Gatling Gun

Douglas D. Scott, PhD*, Nebraska Wesleyan University, 11101 South 98th Street, Lincoln, NE 68526

After attending this presentation, attendees will appreciate the fact that historic firearms have definable class characteristics. The class and individual characteristics are preserved on cartridge cases and bullets that can be very old, and non-judicial situations provide firearm identification theory and methods validation opportunities.

Firearm identification procedures are well established and used routinely in medic-legal situations. This presentation will impact the forensic community and/or humanity by demonstrating how studies of historic firearms can be used as additional validation opportunities of firearm identification theory and methods. In addition, class characteristic data from historic firearms provides archaeologists and others studying historic battlefields more data sets to enhance their interpretation opportunities of past conflict.

The Gatling gun is one of mid-19th century's most iconic firearms. Sold world-wide it saw action in many places around the globe in the late 1800s. Examination of several Gatling guns has identified a series of class characteristics that are transferred to cartridge cases and bullets during firing. While the Gatling gun is unlikely to be used in crime today, determining the class characteristics for this historic weapon is an interesting validation exercise in pattern transfer theory, and a valuable data set for battlefield archaeology use where Gatling guns were employed. Thirty-nine fired .50-70-caliber cartridge cases, one misfired round, and six .50-caliber bullets were submitted for analysis from an 1874 Red River War battlefield where Cheyenne warriors attempted to protect their families from an Army attack led by General Nelson A. Miles. This west Texas site represents the first recorded use of a Gatling gun in combat in the United States since the Civil War. The Gatling gun was used in combat by the U.S. Army only twice more before the Spanish-Cuban-American War of 1898. The .50-70 caliber bullets and cartridge cases submitted for firearms identifications analysis from 41AM10 were fired in a Gatling gun. The land and groove striations on the bullets, and the firing pin and extractor marks on the fired cartridge cases are consistent with barrel rifling, firing pins, and extractor characteristics found on surviving Gatling guns. This firearms identification analysis is the first time Gatling guns have been identified in an archeological context.

Historic, Firearms, Class Characteristics

D21 Virtual Autopsy of a Natural Mummified Fetus: About One Case

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The goal of this presentation is to illustrate the potentialities of the multi-slice computed tomography (MSCT) for the study of a natural

fetal mummy in term of skeletal evaluation (to research abnormalities), but also in term of gestational age assessment using methods not directly accessible during autopsy.

This presentation will impact the forensic community and/or humanity by providing an example of forensic application of the MSCT.

Background: Multi-slice computed tomography (MSCT) is uncommonly used in forensic pathology. The authors present a case of MSCT examination of a natural mummified fetus. This exploration was performed in order to determine gestational age and make an exhaustive skeletal study of the fetus.

Purpose: This case report illustrates the potentialities of the MSCT concerning one natural fetal mummy in terms of skeletal evaluation to research abnormalities, but also in term of gestational age assessment using methods not directly accessible during autopsy.

Introduction: A jar containing the body of a fetus was found in a bush near a building. The body was mummified. The body was unidentified. A medico legal autopsy was ordered. Multi-slice computed tomographies (MSCT) examination of the fetus was performed in order to determinate gestational age and make an exhaustive skeletal study of the fetus. It was followed by an autopsy and an anatomo-pathological study to evaluate gestational age and detect potential malformations. Results of the different studies were finally compared.

Material and Methods: *Imaging study:* a full body MSCT exploration was performed with a 16 x 0.75 mm collimation on a Sensation 16 unit (Siemens, Germany). Based on results of obstetrical osteometrical criteria by measurement of different parts of the fetus, an assessment of the gestational age was made. Age estimation based on temporal bones analysis was also performed. Two- (2D) and three dimensional (3D) reconstructions were obtained on a Leonardo workstation (Siemens, Germany). Images interpretations were performed by board-certified radiologists.

Autoptical and anatomo-pathologic studies were performed by board-certified forensic pathologists. All three body cavities (cranium, thorax, and abdomen) were examined. The lengths of the tibia and the foot were measured. Anatomo-pathology was performed after a fixation in 10% formalin and decalcification with nitric acid.

Results: *MSCT imaging:* the MSCT exploration found no traumatic bone fractures. Air between the skull and the cerebral hemispheres and the prominence of the ventricles were clearly visualized; both were caused by volume loss. The cerebral hemispheres, cerebellum, pons, medulla oblongata, and the spinal cord could also be seen. In the thorax, the lungs appeared tiny, non-aerated. The trachea and both major bronchi were visible, with lumen air-filled. The esophagus was visible from its proximal to distal extremity, filled with air. The heart was seen, but characterization of the four cardiac chambers was not possible. The liver was visible. The stomach contained air. Other internal organs were not identifiable because of an insufficient spontaneous contrast. The length of tibias was 40 millimeters, what corresponds to a gestational age of 23 weeks. Concerning external ear, both external auditory canals were well defined, normally aerated. Concerning middle ear, the malleus, stapes, and incus were present with a non-disrupted ossicular chain. The footplate of the stapes is visualized within the oval window. Concerning internal ear, MSCT scan shows that cochlea and vestibule had reached full adult size. The lateral, posterior, and superior semicircular canals were visible. The labyrinthine segment of the facial nerve canal was well developed. Internal auditory canal was also well defined. Both vestibular aqueducts were visible but not cochlear aqueducts. The labyrinthine segment of the facial canal and the pyramidal process were well defined. All this image's findings were in favor of a gestational age ranged between 22 and 24 weeks.

Autopsy and anatomo-pathology: the body was a male fetus completely mummified. The distal extremity of the navel string was present but the placenta was absent. The fetus was curled oneself up. No malformation was noted. The examination of the body revealed no evidence of trauma. The autopsy was difficult because of the dried

consistence of the corpse. It was very fragile and it was not possible to free the anterior part of the body without breaking the upper and lower members. The length of tibias was 40 millimeters, which corresponds to a gestational age of 23 weeks. The length of the foot was 35 millimeters, which represents an estimated gestational age ranging from 21 and 22 weeks. The tibia presented an endochondral ossification. The periosteum was ossified. The striated muscle comported well defined striations. The skin had a keratinised epidermis. Dermal papilla and sebaceous glands and papilla of hair were visible. An endochondral ossification was noted in the temporal bone. Ossicular chain was visible, surrounded by mesenchyma. The facial nerve was also visible. The three semicircular canals were present. Ossification had started in the cochlea. Histological analysis confirms that the fetal growth (osseous, vestibulocochlear, cutaneomuscular) was at least 20 weeks.

Discussion: Gestational age is determined by estimation of the fetus's development age concluded from the skeletal growth. With the development of prenatal ultrasonography, several abacuses became available for complete fetuses or ossified parts of developing bones. In forensic practice, abacuses can be useful in real anatomical conditions; however, radiographic methodology has to be applied when skeletal preparation is impossible or undesirable. MSCT give an isotropic image, with no deformation of the anatomical reality. This is important because measuring lengths of long bones on 2D reconstructions gives directly the anatomical length, without using corrective factors. In cases of particular position, as in this case, radiographic evaluation of the long bones' lengths with plain X-Rays seems to be difficult or impossible because of the superposition of the bones caused by the particular position of the body. MSCT permits with one single scanning to determine all or most of the long bones' lengths. Furthermore, it allows a skeletal and visceral exploration to determine if major abnormalities are present or not. A supplementary element to assess gestational age was used in this case: the analysis of the structures of the temporal bones. Although this exploration is not accessible to autopsy, study of the temporal bone is important for detection of congenital disorders and may bring elements to assess the gestational age. Furthermore, autopsy of mummified corpses is technically difficult because of the leak of elasticity of the different parts of the body, which break easily. Measures of long bones performed on MSCT images and on histological samples were identical and consequently gestational age assessment too. Study of temporal bones on MSCT images and histological samples were precise. Of course, accurate dating through histogenesis is imprecise because of the maternofetal factors which may interfere with the fetal development (drug addiction, metabolic disorders). However, it may give elements for estimate the range of gestational weeks.

Conclusion: MSCT is a non-destructive method available for mummy investigation. This case report illustrates the potentialities of the MSCT concerning one natural fetal mummy in term of skeletal evaluation to research abnormalities, but also in term of gestational age assessment using methods not accessible to autopsy.

Computed Tomography, Mummy, Fetus

D22 The Microscopic Characteristics of Drying and Transfer of Impacted Bloodstains on Fabric and Textiles

Marilyn T Miller, MS, EdD, Elizabeth DiMarchi, and Lei Zhang, BS, Virginia Commonwealth University, Box 842012, 1000 West Cary Street, Richmond, VA 23284-2012*

After attending this presentation, attendees will understand the microscopic appearance of drying and dried impacted bloodstains as part of a bloodstain pattern analysis.

This presentation will impact the forensic community and/or humanity by allowing for more precise determinations of time for bloodshed events where impacted bloodstain patterns are present.

Blood shed events and the resulting bloodstain patterns have been used for the purposes of crime scene reconstruction for many years. It is widely accepted in courtrooms, crime scene investigations, and taught extensively to criminal justice and forensic science students throughout the United States. Although bloodstain pattern analysis is widely accepted and widely taught, this project's testing in the area of microscopic analysis of bloodstain transfer mechanisms on drying has not been researched.

This project extensively analyzed and documented the semi-microscopic drying mechanism of medium force impact blood spatter on selected natural and synthetic fabrics. Additionally, the photo-documentation of the semi-microscopic mechanisms by which blood could be transferred between fabrics was examined.

The results of the drying tests show that the impacted bloodstains immediately become incorporated into the matrix of the fabric and not as predicted, the stains do not remain on the surface of the fabrics while drying. The quick drying of these impacted bloodstains within the fabric matrices also seems to make transfer by contact difficult even with added force.

Bloodstain Patterns, Impacted Blood, Microscopic Drying

D23 Suicides in Tarrant County Medical Examiners District Between 1996-2005: A Ten Year study

Nannepaga Zachariah, PhD, and Nizam Peerwani, MD, Tarrant County Medical Examiners Office, 200 Feliks Gwozdz Place, Ft. Worth, TX 76104*

After attending this presentation, attendees will understand the role of the Medical Examiners office, to assist the community to understand the distribution of suicides in Tarrant County according to the age, race, and sex.

This presentation will impact the forensic community and/or humanity by providing knowledge of suicidal trends during the last ten years, as related to sex, race and different age groups; and comparing suicidal rates to the geographic location of Tarrant County establishing a possible impact on economic status.

The Tarrant County Medical Examiner's Office serves a tri county population of over 2.2 million that includes Tarrant, Denton, and Parker counties. Approximately 200 suicide cases of all age groups, races, and cause of suicide are recorded annually. The following table gives the suicide data between the years 1996 and 2005 including suicide rates per 100,000 population.

Table1 Distribution between 1996-2005

GENDER	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
MALE	155	155	133	136	141	124	134	169	147	200	1494
FEMALE	36	36	34	29	29	51	50	44	60	48	417
TOTAL	191	191	167	165	170	175	184	213	207	248	1911
% of TOTAL	9.9	9.9	8.7	8.6	8.8	9.1	9.6	11.1	10.8	12.9	100%
RATE/PER 100,000 POPULATION	11.2	10.9	9.2	8.8	8.6	8.7	8.8	9.8	9.3	10.7	

Table 2 Distribution among Race

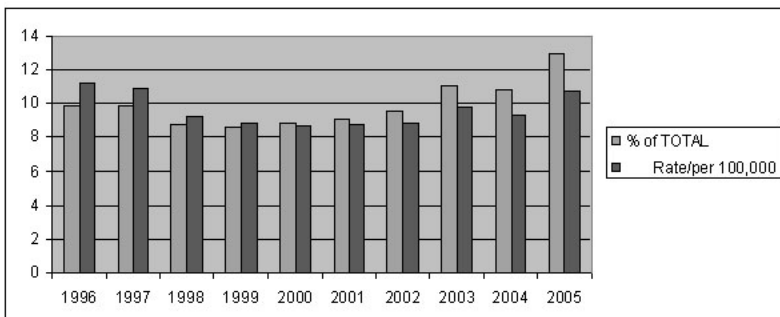
RACE	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
WHITE	160	168	143	136	145	125	126	179	175	214	1571
BLACK	11	7	7	7	11	10	28	13	14	16	118
HISPANIC	17	13	13	20	12	36	22	15	13	14	183
OTHER	3	3	4	2	2	4	8	6	5	4	41
TOTALS	191	191	167	165	170	175	184	213	207	248	1911

Table 3 Distribution among Age Groups

AGE	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
00--10	1	0	0	0	0	0	0	0	0	0	1
11--20	24	23	21	14	21	13	10	20	24	18	188
21--30	36	28	34	33	32	22	26	32	37	50	330
31--40	41	42	35	34	39	40	48	45	37	42	403
41--50	42	47	26	36	29	47	38	55	47	56	423
51--60	23	18	21	20	19	30	29	37	40	42	279
61--70	11	14	16	9	10	7	10	15	14	17	123
71--80	11	10	12	14	8	12	17	6	5	11	106
OVER 80	2	9	1	4	8	4	6	3	3	10	50
UKN	0	0	1	1	4	0	0	0	0	3	8
TOTAL	191	191	167	165	170	175	184	213	207	249	1911

Table 4 Cause of Suicide

CAUSE	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
DRUGS/POISONS	20	14	13	16	8	20	26	27	26	26	196
FIREARMS	107	123	109	110	95	116	97	115	116	148	1136
HANGING	35	27	27	23	41	27	41	43	43	43	350
OTHER	29	27	18	16	26	12	20	28	22	32	229
TOTAL	191	191	167	165	170	175	184	213	207	249	1911



1. Over the ten year period there seems to be a declining trend in suicide rates from 1996 to 2000. Somewhat of an increasing trend in suicide rate is indicated during recent years. See Graph.

2. Collected data over the last 10 yrs indicate suicide rates are much higher in males (78.1%) than in females (27.9%).

3. Predominantly higher rates are observed in white population (82.2%) followed by hispanic (9.4%) and black population (6.15%).

4. Among all the methods studied, death was predominantly caused by a firearm throughout the 10 year period (59.4%) followed by Hanging 18.3%, Drugs and Poisons 10.2%. The remaining 22.9% included other causes such as asphyxia, fire, CO, drowning, blunt force and sharp force trauma, and vehicular related.

Tarrant County, Suicide, Suicidal Rate

D24 An Unusual Death by Suffocation With a Plastic Bag: How a Motion Picture Can Help to Make the Distinction Between Homicide and Suicide

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After attending this presentation, attendees will understand the circumstances of an unusual suicide. The suicide is discussed to reduce the potential for mistakes in such cases in which it may be difficult to establish whether suicide or homicide occurred.

This presentation will impact the forensic community and/or humanity by demonstrating that manner and cause of death could be determined only by a thorough analysis of the physical and circumstantial evidence available to the medicolegal team.

Introduction: Asphyxia by smothering involves the mechanical obstruction of mouth and nose. Asphyxial deaths due to plastic bags may result from accidents, suicides, or homicides, although suicides seem to predominate.

Case report: A 32-year old married truck driver was found dead by the police lying in the fetal position in his truck on a desert street. The head was enclosed in a large clear plastic bag with its open end fixed to the neck with a rope. The wrists were firmly tied by a rope and the man was fully dressed in his usual daytime clothes. The doors were locked from the inside. There was no evidence of violence, and neither pornographic material nor autoerotic paraphernalia was found. A DVD was found in the glove compartment ("The life of David Gale", a 2003 motion picture directed by Alan Parker). A remarkable cyanosis of the face and lips, and subconjunctival petechial hemorrhages were noted. A medicolegal autopsy was ordered by the public prosecutor's department. The external examination was unremarkable. The autopsy showed thin hemorrhages in the subcutaneous tissues of the neck and in the lower rectal mucosa. The lungs were congested. No fracture of the hyoid bone or the thyroid cartilage was noted. Swollen glands were located around both sternocleidomastoid muscles. There was no lesion of fight or self defense on the body. The toxicological analysis was negative. The histologic examination of the rectal mucosa showed aspecific abnormalities. A diagnosis of death due to plastic bag asphyxia was made. This was initially treated by the police as homicidal case. The legal inquiry revealed that the man was not known to have attempted suicide before. He had homosexual relationships and had been diagnosed HIV positive two days prior to his death. "The life of David Gale" was seen by the police. In this movie the main character is found lying on her kitchen floor naked, hand-cuffed with a plastic bag over her head. The ending reveals she has committed suicide. Data eventually led to the conclusion that this case had actually been a suicide.

Discussion: In this case, the man had obviously committed suicide using the method he had seen in the movie. He had just learned he suffered from HIV and this should have led him to the revelation of his double life to his wife. Medicolegal data alone would not have determined whether homicide or suicide had occurred in this case. It is very infrequent in France to establish the manner of death thanks to seeing a motion picture.

Asphyxia, Suffocation, Plastic Bag

D25 The Study and Forensic Significance of Drill Bit Use Indicators

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After attending this presentation, attendees will learn how to identify a used drill bit and the forensic significance of tool marks on swarf (shavings and particles) produced during a drilling process.

This presentation will impact the forensic community by showing that a drill bit could be an important piece of information to close a bombing case and broadening Forensic Scientists' knowledge spectrum.

Every piece of the forensic evidence has the potential of supplying a valuable investigative lead, and even the tiniest pieces are examined thoroughly to assist the investigators in solving bombing cases. Drill bits are one piece of evidence that is often overlooked during a case investigation. Most domestic bombs in the United States are pipe bombs using metal or plastic containers filled with low explosive powders. Black steel and galvanized steel pipe with iron end caps are the most common metal containers among metal pipe bombs. Polyvinyl chloride (PVC) and chlorinated PVC (CPVC) are the most common plastic pipe bomb containers used in device making. The majority of these pipe devices are manufactured to be initiated with a length of pyrotechnic fuse through a fuse hole. A functional fuse would initiate the explosives inside these pipe devices. Since electric drills (cord or cordless types) are common household tools, most of the fuse holes are made by using these types of drill with a drill bit. The drill bit used for drilling the fuse holes can provide important forensic values to case investigations. For example, linking a drill bit to a device could directly link a suspect to a particular scene or device. However, no study has been done in the area of drill bits. In this study, the forensic and evidentiary values of a drill bit was investigated. With the results of this study, investigators were able to conclude that there are three indicators for determining if a drill bit is used. If a drill bit is used, one of these three indicators or the combination of all three indicators should be used as a guideline for evaluation. The three indicators are: 1). particulate deposits on the drill bit, especially inside the flute and the tip area; 2). physical damage including chipping, abrasion, and abuses on the drill bit mostly occurred on the flute edge bevels and lip edges; and 3). thermal damage. During this study, the forensic values of tool marks of drill bits were also evaluated. The study concluded that there is no mechanical break-in process like firearms barrel for obtaining reproducible tool marks. The tool marks on swarf were well defined and can be examined and individually associated.

Drill Bit, Tool Marks, Shavings

D26 Digital Evidence Practitioner Standards: Issues and Possible Solutions

Marcus K. Rogers, PhD, Purdue, 401 North Grant Street, West Lafayette, IN 47907*

After attending this presentation, attendees will have a better understanding of the challenges facing current efforts aimed at standardizing the digital evidence process and practice.

This presentation will impact the forensic community and/or humanity by demonstrating how the successful and timely development of standards is the key requirement in order to mature the relatively new forensic discipline of digital forensics.

The current presentation will examine issues related to developing standards for digital evidence practitioners. An overview of current efforts will be presented. Representative efforts from law enforcement, private sector, government, and academia will be compared and contrasted. A framework for successfully developing standards,

domains of knowledge, and a common body of knowledge will also be presented. With the rapid increase in digital evidence, the development of national and international standards is paramount in order to mature the discipline of digital forensics in general and digital evidence specifically.

Digital Evidence, Digital Forensics, Computer Forensics

D27 Color Perception and the Description of Evidence

Keith B. Morris, PhD, West Virginia University, 2925 University Avenue PO Box 6121, Morgantown, WV 26506-6121; Robin T. Bowen, MA, West Virginia University, 3040 University Avenue Room 3102, PO Box 6217, Morgantown, WV 26506-6217; and Rebecca L. Fitzsimmons, BS, West Virginia University, 3040 University Avenue Room 3102, PO Box 6217, Morgantown, WV 26506-6217*

After attending this presentation, attendees will understand the correct use of the ISCC-NBS Dictionary of Color to describe the color of an item of evidence. This practice is tested by observers who need to define their own color description versus choosing one from a list of standardized color terms.

This presentation will impact the forensic community and/or humanity by introducing methods of standardized color description and the underlying reasons. The use of standardized color will diminish the potential misperception of a color description in the courtroom.

Color perception is an area which has been studied vastly in the past. It is an area which still needs development since color is a basic characteristic which is cited in physical evidence. Matching of color takes place in paint and fiber examinations on a micro-scale and color is frequently used on a macro-scale by forensic scientists and crime scene technicians in the description of evidence.

Forensic scientists should make use of a limited palette when describing the color of an item of evidence. Color may be attributed to an object in both subjective and objective manners. The determination of Munsell or CIE Lab color coordinates does not mean much to the layperson or even a forensic scientist who does not have experience with color theory.

A number of subjects were tested by evaluating a palette of colors and assigning a color to each swatch in the palette. In the control study the same group was asked to link a list of colors from the ISCC-NBS Dictionary of Color to a different palette of colors. It was hypothesized that the accuracy of the two groups can be differentiated from each other where individuals are far better at linking a color to a given color swatch than being able to define the color for themselves.

The research aimed at evaluating the observers' definition of a color name such as turquoise. It has been described as bluish-green, light bluish-green, bright bluish-green, medium bluish-green and medium greenish-blue. This has indicated that amongst users there is no standard nomenclature of describing a color. When asked to link an ISCC-NBS color to a Munsell color chip (5PB 7/4, pale blue) the observers were provided with a list of colors namely, light blue, light bluish gray, moderate blue, grayish blue, bluish gray, pale blue, and very pale blue. Although none of the observers identified the color as pale blue, all of the selected colors were of the same or a little lower chroma. The Munsell colors are related to the fourth level of the six levels of the Universal Color Language. In the fourth level the steps of the hue and value components of a Munsell color are limited to one unit. The fourth level consists of 943 to 7056 colors. The colors used by the ISCC-NBS color naming system comprises of 267 color names (third level). Pale Blue, for example, extends over a chroma range of 4.5 units and the value over a range of two units. The first and second levels comprise of 13 and 29 colors respectively.

The provision of a juror of a more accurate description of a color will allow them in their own minds to make a color definition. Use of a standardized color nomenclature system in forensic science will also

result in better testimony and minimized question regarding evidence description. Moving from the first level through the third level introduces more variations. Simply utilizing the fourth level would be too technical for a jury as is applied to casework analysis. This paper will provide support for the explicit use of at least the second level as descriptive colors in forensic casework.

Color, Perception, standardization

D28 Biometric Devices and Software for Facial Comparison and Iris Matching: Use in Forensic Science?

Zeno J. Geradts, PhD, Arnout Ruifrok, PhD, and Rikkert Zoun, MS, Netherlands Forensic Institute, Laan van Ypenburg 6, Den Haag, SH 2497GB, Netherlands*

After attending this presentation, attendees will understand how the various aspects of biometric devices and the use of biometric software for face and iris comparison will impact casework.

This presentation will impact the forensic community and/or humanity by demonstrating the challenges in using these systems in investigations, and the information that can be extracted as evidence from digital traces in these systems.

The use of biometric properties in access control is growing. Nowadays these devices used for access to computers, sport clubs and of course the borders. The ICAO-standards for implementation in a biometric passport are an example of this. In these ICAO-standards, the specifications are given of the contactless chip and of the resolution of the images. As the storage in these chips is limited, the quality, due to the resolution and compression of facial images is not enough for a proper forensic face comparison.

Many implementations of biometric devices and software are available in commercial products, such as use of facial comparison, iris, finger prints, hand scanner, vein scanner etc.

With the use of biometric systems, the possibility to enter the biometric features in databases also exists. In this way, a person can be identified from the database. An overview will be given in this presentation of the biometric properties of such a system, such as false acceptance rate, false reject rate, failure to enroll rate.

For forensic science, it is important to know how the systems can be circumvented, since the digital traces from these devices might be used as evidence in court.

In theory, it would be easier to follow a person, and check if the person is actually there. However, a problem is that with the wide use of biometric systems, it becomes easier to spoof a fingerprint, or another biometric feature. Examples of spoofing biometrics are well known, and some of them can be easy.

For evaluation of biometric systems in forensic science, it might be useful to have databases of faces and irises, such as is also implemented in the widely used AFIS-systems. In Netherlands Forensic Institute laboratory, a widely used facial biometric system and an iris system were analyzed. The results of this research, with different properties of the systems, are presented.

Another field of research is the linkage of biometric properties. In practice, it appeared that on several commercial devices no encryption was used, which make it easier to sniff biometric properties such as fingerprints from the USB-connection.

To date, there have only been a few cases requiring analysis of biometric devices. One case was a PDA with fingerprint access control. To enter the system, a rubber stamp was manufactured from a slip of the suspect. It is expected that there will be more cases with biometric devices in the future. Current research focuses on the value of image databases for facial comparison.

Biometric Devices, Iris Matching, Facial Comparison

D29 Forensic Voice Line-Ups: Intentional vs. Incidental Memory

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After attending this presentation, attendees will learn to improve their methodology when administering voice line-ups.

This presentation will impact the forensic community and/or humanity by demonstrating how to improve methodology when carrying out voice line-ups. It will help the expert and the courts to better assess the performance of ear witnesses.

While forensic voice comparisons are normally carried out by the forensic phonetician based on speech samples recorded during the incident (questioned sample) on the one hand and reference material from the suspect on the other, there are also cases in which no questioned recording is available, and yet one or more witnesses or victims claim that they will recognize the perpetrator's voice. The basic question asked in this contribution is thus whether witnesses who (claim to) have intentionally memorized the perpetrator's voice can be expected to exhibit a more reliable performance in a voice line-up as compared to witnesses who simply panicked as a reaction to the incident and memorized a somewhat holistic impression of the perpetrator's voice.

The research questions in the present study were as follows:

- Will intentional vs. incidental memory induce a difference in listener performance?
- Will time delay have an effect on listener performance?

A total of four listener groups consisting of 8 (in one instance 9) subjects each participated in the experiment. They were familiarized with the target voice in two separate sessions over high-quality loudspeakers in a quiet room for 12 min. The first group (16 subjects) were expressly instructed to memorize the target voice and they were told that they would later be asked to take part in a speaker recognition experiment. The second group (17 subjects) was instructed to memorize the wording of the message. Thus, their attention was expressly directed to the content of the message and away from the characteristics of the speaker.

Of those two subgroups consisting of 16/17 subjects, eight (in one instance nine) took part in a recognition task after one week and the other eight performed an identification experiment after a four-week delay. All four groups were presented with the same stimulus tape in the recognition experiment. It consisted of single sentences from the "kidnapper's" message that had also been used in the familiarization session. For the target speaker, the text was identical, but the actual sentences were taken from later recordings of the same text (the time span from which the test items dated was approximately 6 months). So in contrast to other studies like e.g., Schiller/Köster (1998) the listeners heard the same wording as in the familiarization, but not the identical passage. In addition to the target speaker, four foils were selected from the above-mentioned data base. They all exhibited the same regional background and age group as the target speaker. For each of the foils, a total of 20 sentences were selected, which results in a grand total of 100 stimulus sentences.

Subjects were instructed to listen carefully to the stimuli and to tick "yes" if they thought that this was the speaker whom they had heard in the familiarization session and to mark their confidence on a five-point scale. They were also reminded of the possibility that the target speaker might not be among the speakers in the recognition session at all. They were not informed about the total number of voices present in the test.

Two groups of listeners performed the recognition task one week after the familiarization session, the two other groups carried it out four weeks after having been familiarized with the voice.

A traditionally well-accepted measure of listener performance is the receiver operating characteristic (ROC) which plots the hit rate against the false alarm rate.

The results of the present study demonstrate that after one week there is practically no difference in recognition rates between listener groups who presumably used intentional as opposed to incidental memory. However, after 4 weeks, recognition rates generated by intentional memory statistically surpassed those generated by incidental memory. Also, incidental memory was found to be significantly worse after 4 weeks than after one week ($p < 0.05$ for both).

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Voice Line-up, Ear Witness, Speaker Identification

D30 Measuring What You Manage — Performance Metrics in Digital Evidence

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After attending this presentation, attendees will have a framework for developing performance metrics in digital evidence laboratories.

This presentation will impact the forensic community and/or humanity by providing useful information to the digital evidence community, and the forensic science community as a whole, concerning the use of performance metrics to manage forensic laboratories.

Digital evidence is one of the newest disciplines in forensic science. The examination of digital evidence has been practiced both formally and informally since the late 1980s. The Defense Department, the Drug Enforcement Agency, the Federal Bureau of Investigation, and the Treasury Department developed formal programs early in the 1990s. Many other law enforcement agencies and a number of forensic laboratories also developed programs since those early days.

Some of the agencies modeled their digital evidence programs on traditional forensic programs, in some cases making digital evidence examination a separate unit or even laboratory within a laboratory system. Most recently, there have developed an entire system of Regional Computer Forensic Laboratories. ASCLD-LAB approved Digital Evidence as a discipline in 2003.

Regardless of the structure or hosting entity, the demand for digital evidence forensic services has grown at a phenomenal rate. The numbers of requests, examinations, and volume of evidence in each case have all expanded faster than the growth in resources which has resulted in tremendous pressure on managers to intelligently grow and manage their programs.

There is a management axiom attributed to Kaplan and Norton that states: "You cannot manage what you cannot measure". Legendary management guru Peter Drucker goes on to say that "what gets measured gets done." Both recognize that the ability to measure performance is critical to effective management.

This paper will discuss the role of performance metrics in digital evidence units, sections, and laboratories, the different types of management metrics and will provide the results of an informal survey of current practice in digital evidence laboratories.

Digital, Management, Metrics

D31 CD-ROM Write Options Affect Calculation of One-Way Cryptographic Hashes

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After attending this presentation, attendees will develop an understanding of the interplay between CDROM file systems and cryptographic hashing tools.

This presentation will impact the forensic community and/or humanity by assisting examiners to avoid incorrectly interpreting the results of hashing algorithms and will be able to develop protocols which will prevent obtaining incorrect results.

One-way cryptographic hashes (or 'hashes' for short) are mathematical algorithms applied to digital media. A common use of hashes in forensics is to demonstrate that digital media has not changed (i.e., not been tampered with subsequent to seizure). The application of a hashing algorithm to a piece of digital media (a file, a forensic image, etc.) should always result in the same unique number, typically of size 128 or 160 bits depending on the particular hashing algorithm used. Change of a single bit on the digital media will result in a significant change to the resulting hash, indicating that the contents of the media have changed.

While validating several comparable hashing software tools against a CD-ROM developed for a competency test several anomalies were found, including the inability of some tools to hash the CD-ROM at all (i.e., the tool 'errors out'), and other tools returning different hashes. Replicating the same tests with the same tools and CD-ROM on different hardware resulted in the same anomalous results. (This eliminated the hardware as the possible explanation of the problem). Therefore two explanations were postulated. The first was that the software tools were not written properly. This solution was eliminated because of the widespread use of these tools in digital forensics and computer security research and practice. It was surmised that the write options used for the CD-ROM affected the ability of the hashing tools to properly calculate the hash.

There are several options that can be manipulated when writing CDs, including disk-at-once versus track-at-once, long versus short file names, multi-session versus single session, and to finalize the CD, to name a few. Note that these options do not change the actual files written to the CD, but only add 'overhead' to the CD. A fully crossed experiment was conducted combining several CD write options across five commonly used hashing tools. The results indicated that the anomalies disappeared when CDs were written using the disk-at-once option. The anomalies reappeared when using the track-at-once option.

The results of the experiments indicate that the options used when writing CDs affect the ability of different tools to properly hash a CD. This may be of great importance in a case, particularly when the expert witnesses use different tools to hash a CD and obtain different results. This kind of incident may cause doubt in the minds of the jurors that could have an adverse impact on the results of a case. This research proposal intends to extend this research to include DVD-ROMS, DVD-RW (read-write) as well as CD-RW (read-write).

Digital Media, Computer Forensics, Authentication

D32 The Role of the Qualified Radiographer in Forensic Investigations

Nancy S. Adams, BS, Itawamba Community College, 202 Milford Street, # 155, Tupelo, MS 38801*

After attending this presentation, attendees will gain insight into the educational requirements for qualified radiographers and develop awareness for the unique skills the radiographer offers in forensic science.

This presentation will impact the forensic community and/or humanity by introducing this important but unrepresented discipline to the American Academy of Forensic Sciences and increase awareness of the value of the highly skilled radiographer to the forensics team.

Mother Nature is on a rampage, or so it appears from recent naturally occurring catastrophic events. Terrorist attacks are escalating around the globe. Although the world's population growth rate has slowed down, projections indicate population levels will be nearly 9.1 billion people by 2050, nearly a 50% increase compared to 2002. The population levels, coupled with extreme weather and unimaginable terrorist activity, present a horrific opportunity for mass tragedies unlike any ever encountered. Add to this mix the genuine threat of pandemics, and humanity faces the real possibility of a staggering number of deaths. The demand for identification of the deceased and determination of causes will be significant. Although radiology has always been a component in forensic investigations, the importance of having qualified, experienced radiographers as team members has not been recognized by the forensic scientific community. The appropriately trained, experienced radiographers, many of whom possess baccalaureate or advanced degrees, offer a unique and valuable set of skills and knowledge to aid in identification and determination of cause. This presentation will provide an overview of the curriculum and clinical education required of radiographers for national board certification. Criteria for advanced practice in the field of forensic radiography will be offered, and the practical skills the radiographer can bring to forensic imaging are discussed. Although the radiographer's scope of practice does not include interpretation and diagnosis, no one in the medical profession critiques the images for positional and technical accuracy or looks at more images than the radiographer. These skills make the radiographer especially adept at recognizing anatomical and positional variations and comparing ante- and postmortem images. These skills also ensure that the radiographer can produce images that correctly mimic antemortem images. And the certified radiographer has been properly educated and trained in a variety of imaging equipment, including C-arms, CT, and digital imaging equipment. The radiographer must be innovative and adaptable as they deal with the greatest variable known to medicine, the living human being. These attributes enable them to function in a variety of conditions and situations that are appropriate when dealing with the dead as well. As a final deliberation, forensic pathologists and other forensic scientists must be mindful of the religious beliefs that prohibit invasive autopsies. This is just one more aspect where the forensic radiographer can be of invaluable service.

Identification, Radiographer, Images

D33 The Excavation, Recovery, and Analysis of Remains From a Series of Interrelated Sites Containing the Mortal Remains of Kosovar Albanians

Jon Sterenberg, MS, Rene Huel, BS, Ana Kron, BA, Jeffrey Buenger, JD, Ana Milos, MS, Arijana Selmanovic, MS, Adnan Rizvic, BS, and Sharna Daley, MS, International Commission on Missing Persons, Alipasina 45a, Sarajevo, 71000, Bosnia and Herzegovina; Marija Djuric, MD, PhD, University of Belgrade, School of Medicine, Laboratory for Anthropology, Department of Anatomy, 4/3 Dr Subotica, Belgrade, 11000, Serbia; Dusan Dunjic, MD, PhD, Institute of Forensic Medicine, School of Medicine, University of Belgrade, Belgrade, 11000, Serbia; and Danijela Djonic, MD, University of Belgrade, School of Medicine, Laboratory for Anthropology, Department of Anatomy, 4/2 Dr Subotica, Belgrade, 11000, Serbia*

After attending this presentation, attendees will understand the complexity of undertaking the excavation and recovery of hundreds of victims from a series of interrelated mass graves using archaeological techniques, the problems that these type of highly political sites can produce, and how a combination of teams from different disciplines can work together to effect a common goal i.e., identification and repatriation.

This presentation will impact the forensic community and/or humanity by providing a broader appreciation of the multidisciplinary inter-political process required for the comprehensive investigation of crimes against humanity and genocide.

During the recent conflict in Kosovo 1999 many hundreds of Kosovar Albanians were killed by various Para-military, military and police units. Following their deaths their remains were collected, often in specific groups, loaded into trucks and transported and interred within a series of large primary mass graves located within a military complex north west of the city of Belgrade.

As part of the International Commission on Missing Persons work within the region to assist in the location, recovery, identification and repatriation of remains related to this and other conflicts, a government initiated project was put into place enabling ICMP experts to attend and undertake the recovery, and DNA led identification of these remains. In conjunction with the recovery anthropological and pathological analysis was undertaken by the Belgrade Institute of Forensic Medicine.

Two separate but related mass graves were exhumed by the Belgrade Institute of Forensic Medicine in 2001. With the assistance of archaeological and anthropological experts from ICMP in 2002, a further three mass graves and two small but important stratigraphically related anomalies were excavated to build a picture of the events that occurred at the site.

In total the remains of 870 individuals were recovered in a variety of decompositional states and with a wide range of associated forensic information.

This paper will attempt to briefly outline the political situation at the time of ICMP involvement, the process by which the ICMP archaeological team set about locating the individual sites and remains including the use of non-invasive geophysical 'resistivity' and electrical imaging, the method of recording applied to all sites and remains encountered, the process of DNA sampling and testing and the final political problems encountered during the repatriation process.

Two further linked papers will also be presented, 2] a description of the anthropological data obtained at the sites, and 3] a review of the DNA technology used by ICMP to identify the remains. This will include a brief description of the method of the blood collection from surviving family members and the use of the DNA as a means of support for the archaeological observations made during the excavation.

Mass Graves, Excavation, Political Arena

D34 Batajnica: The Contribution of Anthropological Data to Identification of Mortal Remains of Kosovar Albanians

Marija Djuric, MD, PhD, Laboratory for Anthropology, Department of Anatomy, School of Medicine, University of Belgrade, 4/2 Dr Subotica, Belgrade, 11000, Serbia; Dusan Dunjic, MD, PhD, Institute of Forensic Medicine, School of Medicine, University of Belgrade, Belgrade, 11000, Serbia; Danijela Djonic, MD, MS, Laboratory of Anthropology, Department of Anatomy, School of Medicine, University of Belgrade, 4/2 Dr Subotica, Belgrade, 11000, Serbia; Mark Skinner, PhD, Department of Archaeology, Simon Fraser University, Burnaby, British Columbia, Vancouver, British Columbia V5A 1S6, CANADA; Jon Sterenberg, MS, International Commission on Missing Persons, Alipasina 45a, Sarajevo, 71000, Bosnia and Herzegovina*

After attending this presentation, attendees will understand the complexity of undertaking the excavation and recovery of hundreds of victims from a series of interrelated mass graves using archaeological techniques as well as some of the problems that these type of highly political sites can produce and will gain some knowledge of how a combination of teams from different disciplines can work together to effect a common goal i.e., identification and repatriation.

This presentation will impact the forensic community and/or humanity by providing a broader appreciation of the multi-disciplinary inter-political process required for the comprehensive investigation of crimes against humanity and genocide.

During the recent conflict in Kosovo 1999 many thousands of Kosovar Albanians were killed by various Para-military, military and police units. Following their deaths their remains were collected, often in specific groups, loaded into trucks and transported and interred within a series of large primary mass graves located within a military complex north west of the city of Belgrade. As part of a combined forensic operation between ICMP and the Belgrade Institute of Forensic Medicine, experts from the Laboratory for Anthropology and Institute of Forensic Medicine in Belgrade participated in the recovery and identification of 870 bodies of Kosovar Albanians interred in the mass graves at Batajnica, near Belgrade.

Of these bodies, 136 were legally identified by the end of 2003 providing an opportunity for the forensic experts to evaluate any post-mortem findings of classical markers of identity. This paper will attempt to outline the contribution of anthropological data in identification of this first group of identified individuals.

Sex and age at death of young to middle-aged adults were reliably determined but old adults were markedly under-aged. Stature was reconstructed reliably in 77% of cases. Dental status contributed little to identification efforts. In no case did classical markers of identity require rejection of the DNA-based identification. It is concluded that: sex determination from pelvic bones is very reliable, as are age at death estimates from pelvic and rib standards for young to middle-aged adults but that uncertainty intervals for age at death in older adults be broadened or refined by creation of local osteological standards. It is recommended that: a) more effort should be expended to obtain good dental records by using local dental expertise; b) local osteological standards for age estimation of older persons be created; and c) broader age intervals be chosen (+/-5 years in young adults and +/-10 years in adults older than 50 years).

Kosovo, Anthropology, Sex and Age Assessment

D35 Batajnica: The DNA Analysis of Remains From a Series of Interrelated Sites Containing the Mortal Remains of Kosovar Albanians

Rene Huel, BS, Ana Milos, MS*, Adnan Rizvic, BS, Jon Sterenberg, MS, and Ana Kron, BA, International Commission on Missing Persons, Alipasina 45a, Sarajevo, 71000, Bosnia and Herzegovina*

After attending this presentation, attendees will understand the complexity of undertaking the excavation and recovery of hundreds of victims from a series of interrelated mass graves using archaeological techniques as well as some of the problems that these type of highly political sites can produce and will knowledge of how a combination of teams from different disciplines can work together to effect a common goal i.e., identification and repatriation.

This presentation will impact the forensic community and/or humanity by providing a broader appreciation of the multi-disciplinary inter-political process required for the comprehensive investigation of crimes against humanity and genocide.

During the recent conflict in Kosovo 1999 many hundreds of Kosovar Albanians were killed by various Para-military, military and police units. Following their deaths their remains were collected, often in specific groups, loaded into trucks and transported and interred within a series of large primary mass graves located within a military complex north west of the city of Belgrade.

As part of the International Commission on Missing Persons work within the region to assist in the location, recovery, identification, and repatriation of remains related to this and other conflicts, a government initiated project was put into place enabling ICMP experts to attend and undertake the recovery and DNA led identification of these remains. In conjunction with the recovery anthropological and pathological analysis was undertaken by the Belgrade Institute of Forensic Medicine. DNA samples were taken during the autopsy procedure at site.

In total the remains of 870 individuals were recovered in a variety of decompositional states, the ICMP field staff undertook a controlled temperature based record of all remains recovered from the sites over a period of days, the results of which have been previously presented at AAFS.

This paper will attempt to briefly outline the relevance of the number of samples taken, type of sample, the statistics for percentage of success and the success of blood samples to bone matches. The success of the application of 'blind' coding bone and blood samples makes the ICMP system a non-political based impartial process. Sampling procedures at the ICMP International Coordination Division and ICMP DNA labs allows staff to work on any sample in complete anonymity.

The success of the blood collection campaign which was specifically designed to communicate the use of DNA together with the importance of giving a blood sample was designed to target the surviving families and together with DNA assisted identification allowed for 95% of the recovered remains to be positively identified and repatriated to families in Kosovo. The remaining remains are awaiting repatriation.

The entire process combining ICMP and Belgrade Institute of Forensic Medicine experts within the excavation, recovery, blood collection, DNA analysis, and final repatriation of these remains is one success that hopefully has led to a more stable region.

Mass Graves, DNA, Anthropology

D36 Forensic Geophysics: Can This Discipline Save CSI Time and Money?

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After attending this presentation, attendees will discover various geophysical techniques available today that can reduce search time for buried evidence in various substrates.

This presentation will impact the forensic community and/or humanity by enlightening the forensic disciplines to the assets of forensic geophysics regarding searches for buried evidence. Attendees will learn how this discipline can determine exact location of evidence within a minimal amount of time utilizing non-invasive, non-destructive techniques.

Geophysical methods have been applied for decades in subsurface geological investigations for oil and gas exploration, as well as environmental issues. However, the forensic utility of geophysics has only recently become generally appreciated. The use of geophysical methodologies, such as Ground Penetrating Radar (GPR) and Electromagnetic (EM) sensing has proven invaluable in the location of buried evidence within various mediums. GPR can detect burial sites (homicide or otherwise) in natural soil or concrete. The advances of EM systems have improved to the point that some EM antennas can discriminate between metal and non-metal objects in the ground. With this more capable technology, targeted objects can range in size from a buried rifle to an expended bullet in a tree.

Forensic geophysics can assist law enforcement in locating clandestine graves and buried evidence with non-invasive procedures. The "line search" technique is replaced with a GPR and EM grid search that generates real-time data pinpointing the exact location of evidence. This data is also used to produce scaled maps documenting where the evidence was found. Forensic geophysics can help eliminate long hours dedicated to search and documentation allowing law enforcement personnel to concentrate on the task of perpetrator apprehension.

Geophysics, Electromagnetic Imaging, Ground Penetrating Radar

D37 Applications of Side Scan Sonar Technology to the Detection of Human Remains in Underwater Environments

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The goal of this presentation is to introduce a baseline data set of acoustic images that illustrate the feasibility of using side scan sonar to detect submerged human skeletal remains in various stages of disarticulation. Preliminary data suggest that the uniformity versus irregularity of the substrate that supports the remains, the configuration of the remains projecting above this substrate, and the presence or absence of associated clothing and personal effects are all significant variables that can affect overall image resolution and therefore the relative utility of this technology in forensic investigations.

This presentation will impact the forensic community and/or humanity by assisting federal, state, and local agencies tasked with locating and processing underwater scenes that contain human skeletal remains in various stages of disarticulation.

Side scan sonar, and other acoustic imaging technologies, have become an increasingly valuable search tool for first responders and law enforcement personnel engaged in locating submerged targets, such as

automobiles, downed aircraft, shipwrecks, and even drowning victims (Fish and Carr 1990; Dupras *et al.* 2006). Nearly all acoustic systems fall into the category of passive or active. Side scan sonar is an active system that uses a transducer mounted inside a torpedo-shaped “towfish” to generate and transmit signals through the water column in the form of high frequency acoustic energy bursts. The reflected echoes of these signals are sensed by the transducer and passed along a tow cable to a view screen and recorder where they are translated into a plan image of the floor surface. Objects and other features with a significant profile above the floor may also be detected in these images. When deployed correctly, by an experienced operator, side scan sonar can be used to systematically cover large search areas in a noninvasive manner, identify targets of potential forensic interest, and preserve their depositional integrity prior to a diver reconnaissance survey and/or recovery operation.

Previous studies have shown that there is a general sequence of skeletal disarticulation that follows the disappearance of soft tissue from remains submerged in aqueous environments, provided that they are not rapidly introduced to anoxic or anaerobic conditions (e.g., burial in sediment) prior to the onset of advanced decomposition (Haglund 1993; Sorg *et al.* 1997; Boyle *et al.* 1997; Martin 1999; Haglund and Sorg 2002). Given this information, the key question then becomes: at what point in the disarticulation sequence can side scan sonar no longer be used effectively to determine the presence or absence skeletal remains? And what types of scene formation processes result in remains deposits that are best suited for acoustic imaging? This initial project, which is still ongoing, attempted to image a fully articulated skeleton, a partially disarticulated skeleton, and isolated skeletal elements (both with and without associated clothing and personal effects) using a MarineSonic Neptune Side-Scanning Active Sonar. Each of these experimental scenes were laid out in the same configuration along three different types of seafloor composition—i.e., hard sand, suspended silt over sand, and coral. Preliminary results indicate that skeletal configurations with a significantly exposed horizontal surface area and vertical profile, on a relatively uniform substrate, can be effectively imaged using underwater acoustic technology.

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Side Scan Sonar, Human Skeletal Remains, Underwater Scene Detection and Processing

D38 Underwater Body Recovery Procedures in Adverse Conditions

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After attending this presentation, attendees will have a basic understanding of how to recover a body from an underwater scene, while enduring adverse conditions in a river and reservoir system. The attendee should understand the importance of the process and procedures for retrieving a body and items of evidentiary value, while preserving and maintaining their integrity.

This presentation will impact the forensic community and/or humanity by demonstrating the consistency, accuracy, and versatility necessary to all investigation procedures.

Underwater recovery of a body from a reservoir and river system is difficult in the best of circumstances. Retrieval of submerged human remains subject divers to unique and often dangerous conditions. These include natural impediments, strong currents, zero visibility, toxic chemicals, entanglement, entrapment, and water temperatures in the 30 degree Fahrenheit range. Historically, body recovery has been a haphazard venture, using such archaic methods as chains and hooks to “drag” the bottom for the body. Oftentimes, untrained and inexperienced divers are sent into the water, jeopardizing their personal safety, as well as preservation of the body, evidence, and the scene. Failure to properly retrieve the body and evidence can lead to unreliable results, inaccurate analysis, and failure to resolve the case. This presentation will address why and how to successfully recover human remains and any evidence associated with them.

A successful underwater body recovery requires a precise, methodical, coordinated approach to locate, retrieve, and preserve human remains and associated evidence. Dive team members must be versatile due to the uniqueness of each dive operation. In this presentation, instruction begins with the point at which the body has been found. Divers must first document, diagram, and map the body's location and position, as proper documentation is crucial to an accurate chain of custody. Photographs should be taken of the human remains in situ to document their position and condition. When this is not possible, due to low or zero visibility, the body is photographed when returned to the land.

Divers must then search the area immediately around the body for additional items, using a radiating circular pattern. The size of the search area is dependant upon the condition of the remains and case circumstances. Items recovered often include detached body parts, weapons, clothing, or jewelry. Typically, divers work in low to zero visibility, using only the sense of feel and one gloved hand, as the other hand is tethered to a tender on the surface. “Feeling” for evidence must be slow and methodical to avoid missing potential items of evidentiary value. When searching for heavy or sunken items, a diver may have to immerse their arm into the thick, sludge-like muck of the river bottom.

Finally, the body should be placed in a specially designed body bag while still underwater, in the same position as found to avoid loss of evidence on or attached to the body. Such evidence may include blankets, ropes, chains, safes, and cinder blocks. Several divers and lifting devices may be required during removal to prevent damaging the body and related evidence. Bagging the body underwater also protects it from unwanted media attention and observation by the decedent's family. Bodies removed from the water are transported to the medical examiner's office for examination and autopsy.

Body, Underwater, Adverse Conditions

D39 Field Observations of Bone Deposition in Six Rivers

Thomas V. Evans, MA, 231 109th Avenue SE, Bellevue, WA 98004*

After attending this presentation, attendees will learn about the current hypotheses of bone transport and deposition within fluvial (river) systems and field evidence that suggests which parts of these hypotheses are valid and how this information could help investigators make informed decisions concerning searches for additional skeletal material from disarticulated and scattered remains.

This presentation will impact the forensic community and/or humanity by demonstrating what parts of existing bone transport theory are supported by observations from the real world as well as what gaps exist in understanding leading to more focused searches for skeletal remains and higher success rates in additional bone recovery. Once the accuracy of the current theory is determined as well as its deficiencies, a predictive theory of bone transport and deposition that can guide the recovery of skeletal remains found in rivers, can be identified.

Attendees will be exposed to the current hypotheses of bone transport and deposition within fluvial (river) systems, and field evidence that suggests which parts of these hypotheses are valid. This information could help investigators make informed decisions concerning searching for additional skeletal material from disarticulated and scattered remains.

Huzzah Creek (Missouri), Levelock Creek (Alaska), a tributary of the El Kejanero River (Kenya), Lugga Maji Chumvi (Kenya), Lugga Mbololo (Kenya), and an unnamed Lugga (Kenya) were all surveyed on foot or by swimming for their modern bone contents. When skeletal material was located information concerning its orientation, burial, modifications, and geologic context were recorded. The resulting observations were compared to the predictions made by previous authors concerning bone transport and deposition to determine which hypotheses are supported by the evidence. Field data was also compared to flume data to determine how applicable such experiments are to real world fluvial systems.

The preliminary data suggests that the author's current hypotheses concerning bone transport and deposition are incomplete however portions are supported by the field evidence. Flat bones lie against the river bed and do not appear to be moving rapidly. Long bones are generally found parallel or perpendicular to flow and likely have variable transport velocities. Long bone shafts that have been cut on either end orient themselves parallel to flow, do not move readily, and are deposited over rapidly. Small bones or bones of irregular shape tend to be transported faster than other bones. Bones with concavities tend to lay concave surface downward and move slower compared to other bones. Lastly bones are preferentially found in places of lowered flow velocity, like behind obstructions or vegetation. Limited observations also suggest that articulated units tend not to move as fast as isolated skeletal elements and large clasts and high energy are needed to produce marked rounding on bone surfaces. These observations are largely consistent with data from flume experiments with bones however a detailed comparison is not possible since the skeletal sample analyzed here is not large enough yet.

Additional observations were made that complicate the understanding of bone transport and deposition, including the presence of scour pits in the river bed above bones, which was not predicted or observed in flume experiments previously.

Practically the information in this talk will inform investigators what parts of existing bone transport theory are supported by observations from the real world as well as what gaps exist in understanding. This would translate in to more focused searches for skeletal remains, hopefully with higher success rates in additional bone recovery. Ultimately a predictive theory of bone transport and deposition is desired, one that can guide the recovery of skeletal remains

found in rivers. However the first step is to determine the accuracy of the current theory, then identify deficiencies and fill the gaps as needed.

Future research should focus on a comparison between experiments performed in the laboratory in conjunction with actualistic experimentation in fluvial settings. Since human remains are difficult to experiment with in the wild, an understanding of how different physical features of bones alters transport is desired, so the developed theory can be applied more readily to human remains.

Fluvial, Deposition, Bones

D40 Muddying the Waters With Red Herrings: Jurors, Juries, and Expert Evidence

Judith G. Fordham, BSc, LLB, Murdoch University, School of Biological Sciences and Biotechnology, Murdoch, WA 6150, Australia*

After attending this presentation, attendees will learn how to improve the presentation of forensic evidence based on feedback from in depth interviews with real jurors in Australia.

This presentation will impact the forensic community and/or humanity by demonstrating reliable information and practical solutions, and a few laughs!

Participants should acquire a realistic appreciation of the manner in which jurors and juries deal with expert evidence in actual trial situations. They will gain an insight into the way jurors and juries process and argue about expert evidence and integrate it with other evidence. Questions such as the following will be explored,

- When each side calls experts who disagree about the same fact situation, how does a lay juror approach his or her deliberations?
- What experts, lawyers, and judges can do to help a juror understand?
- How experts may enhance his or her credibility?
- Do we underestimate the capacity of the jury to assess expert evidence?

The presentation will be useful for both attorneys and forensic practitioners, giving insights into which methods of presentation of evidence work and which do not.

Proposition: Jurors, many without technical training and by definition requiring expert help to assess forensic evidence are required to:

- integrate that evidence with other evidence
- assess opposing expert interpretations of other evidence
- in unfamiliar circumstances
- with a group of strangers
- often without the most rudimentary aids to understanding

It has been suggested that the jurors, even in ordinary cases, are incompetent as fact finders, are unable to cope with technical or lengthy evidence, and are bedazzled by experts, often accepting what is said unquestioningly.

There have been many suggested reforms, ranging from provision of written copies of evidence, summaries, flowcharts, pretrial tutorials, allowing jurors to question experts and allow note taking.

Synopsis of the content: Data will be presented from exit surveys and extensive semi-structured interviews with real jurors after trials involving complex expert evidence. The study aims to

- Identify factors which inhibit or assist juror comprehension by examining the way jurors deal with expert evidence including juror perception of information, interpretation of facts both individually and collectively, application of case facts and ability to compare and contrast all evidence presented.-
- Provide information, not speculation, for experts, lawyers, and judges.

To the best of this author's knowledge, research of this nature has not been carried out in the "British" justice system. As a senior criminal trial lawyer and Associate Professor in Forensic Science, the author is able to provide a realistic assessment of the practical implications of the findings.

Conclusion: The so-called “CSI effect” may be an urban myth. The jury is more capable of following and fairly assessing expert evidence than commonly thought. Some jurors want radical changes, such as the ability to ask questions of experts.

Juries, Evidence, Forensic

D41 Enhancing Bloody Footwear Impressions: Infrared Photography Compared to Amido Black Treatment

James A. Bailey, PhD, Minnesota State University Mankato, 109 Morris Hall, Mankato, MN 56001*

After attending this presentation, attendees will understand: (1) a procedure for recording digital infrared images of bloody footwear impressions on dark and multi-colored fabric, (2) a procedure for developing bloody footwear impressions using amido black, and (3) the advantages and disadvantages of using digital infrared photography and amido black for enhancing the impressions.

This presentation will impact the forensic community by demonstrating the importance of enhancing bloody footwear impressions at crime scenes.

Footwear impression evidence is difficult to observe on dark or multi-colored fabric; therefore, impression evidence could easily be overlooked at crime scenes. Investigators should search for garments or fabric items that could contain bloody impression evidence although blood evidence may not be readily detected on the fabric items. Some chemical tests used for bloody footwear impression enhancement include: luminol, Hungarian red, Crowles double staining solution, aqueous leucocrystal violet (ALCV) and amido black. Some of these chemicals yield improved enhancement on porous surfaces and some yield improved enhancement on nonporous surfaces. The purpose of this presentation is to present the results of a study that evaluates infrared photography and amido black for enhancing bloody shoe impressions on dark or multi-colored fabric. Footwear impression evidence is probable at scenes where blood evidence is present.

In this experiment, 20 footwear impressions were prepared for infrared photography and subsequently treated with a solution of amido black (Naphthalene Black 12B), a protein dye stain that turns blue-black when it comes into contact with blood. A variety of fabrics including solid dark colors, multi-colored designs, floral prints, and plaids were selected for testing. The fabric samples also contained different weave types and fiber blends. The fabric samples were cut into pieces 15.24 cm by x 35.56 cm (6 in x 14 in) in size. Ten samples were 100% cotton, five samples were 100% polyester and five samples were mixed blends. The mixed blends included one sample of 90% polyester and 10% cotton, one sample of 50% polyester and 50% rayon, one sample of 72% polyester and 28% cotton and two samples that consisted of 60% cotton and 40% polyester.

Bloody shoe impressions on the fabric samples were collected by using the following procedure. A piece of 100% white cotton fabric was placed in a glass dish 22.86 cm x 33.02 cm (9 in x 13 in) and saturated with bovine blood. Each shoe impression was produced by stepping onto a piece of presoaked bloody cotton fabric in the glass dish and then by stepping onto a pre-cut fabric sample. The sample impressions were allowed to dry. Once dry, both color and infrared photographs were taken to enhance the impressions. The samples were then treated with a solution of amido black. The amido black solution was prepared by adding 0.2 grams of amido black to 90 mL of methanol and 10 mL of glacial acetic acid. Each sample was saturated with the amido black solution using a wash bottle while holding the sample in a glass dish at a 45 degree angle. After 2 minutes, the samples were washed with a mixture of 90 mL methanol and 10 mL glacial acetic acid to reduce background staining and dried at 20°C (68°F).

Digital infrared images were made with a 35 mm Nikon D-70 camera with an 18-70 mm f 3.5 – 4.5 G ED-IF AF – S DX Nikkor lens and a 67 mm #87 infrared Tiffen filter. The jpeg fine setting with a medium image size was used to record the exposures. The image file size for this combination of settings was approximately 1.6 mega bytes per image. Experimental camera settings were used to determine the most effective exposure. The lens to object distance was 22.86 cm (9 in). The shutter speed was approximately 2 seconds at f - 3.5 using daylight illumination. The results provide the investigator with a procedure to record optimum digital infrared images of bloody footwear impressions.

Of the 20 footwear impressions, 9 (45%) were enhanced using infrared photography and 11 (65%) were not. Of the samples enhanced, 4 (20%) were 100% cotton, 4 (20%) were 100% polyester and 1 (5%) was from the mixed fabric blends. The mixed blend fabric that was enhanced was 60% cotton 40% polyester.

Of the 20 footwear impressions, 11 (55%) were enhanced using amido black and 9 (45%) were not. Of the samples enhanced, 6 (30%) were 100% cotton, 1 (5%) was 100% polyester and 4 (20%) were mixed fabric blends. All of the footwear impressions on the mixed blends were enhanced by the amido black.

Infrared could be utilized to record images of footwear impressions on dark colored fabric because the procedure is nondestructive and the results are immediate. However, if the infrared image is unsatisfactory, amido black enhancement could be attempted as an alternative method on the evidence. Even though there is some background staining with the use of amido black it does enhance pattern details on some fabrics. Also, according to one study there have been successful attempts in DNA typing after using amido black for the enhancement of bloody impression evidence.

Infrared Photography, Amido Black, Bloody Footwear Impressions

D42 Cocaine Related Deaths in the Tarrant County Medical Examiner’s District, A Ten Year Study: 1996-2005

Nannepaga Zachariah, PhD, and Nizam Peerwani, MD, Tarrant County Medical Examiner’s Office, 200 Feliks Gwozdz Place, Fort Worth, TX 76104*

After attending this presentation, attendees will understand the abuse of cocaine related to sex, age, and race in the Tarrant County population.

This presentation will impact the forensic community and/or humanity by providing the trend of cocaine abuse over a ten year period.

Cocaine, a tropane alkaloid, is a powerful stimulant and is derived from the leaves of coca plant, a plant whose stimulating qualities are well known to the ancient people of Peru, and other pre-Columbian South American societies. The name comes from the coca plant plus the alkaloid suffix –ine. There is a long list of prominent intellectuals, artists, and musicians who have used the drug ranging from Sir Arthur Conan Doyle, Sigmund Freud, to President General Ulysses S. Grant. It is an illicit drug and excessive use can lead to convulsions, seizures, stroke, cerebral hemorrhage, or heart failure. Mixing with alcohol is a dangerous cocktail and can greatly increase the chances of sudden death. In fact it is the most common two drug mixture when sudden death occurs. The purpose of this study is to establish any pattern of cocaine related deaths, due to sex, age, race and geographic location in the Tarrant County Medical Examiner’s district, which serves a tri-county population exceeding 2.2 million, between the years 1996-2005. The data was collected from all cases of natural, accident, suicide, and homicide deaths. The cause of death being a mixed drug overdose, out of which, at least one of the drugs being cocaine. The data is summarized as follows:

Table 1. 1996-2005 Deaths Related to Cocaine – Cause of Death

Cause:	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Accident	37	48	31	43	40	40	41	65	65	45
Homicide	0	0	0	0	0	0	0	8	0	0
Natural	0	0	0	0	0	1	0	4	0	0
Suicide	0	0	1	1	0	0	0	9	0	0
Undeterm	1	3	4	2	1	1	0	3	0	0
Total:	38	51	36	46	41	42	41	89	65	45

Table 2. 1996-2005 Deaths Related to Cocaine – Among Gender

Gender:	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Female	8	7	9	13	11	10	7	18	14	17
Male	30	44	27	33	30	32	34	71	51	28
Total:	38	51	36	46	41	42	41	89	65	45

Table 3. 1996-2005 Deaths Related to Cocaine – Among Race

Race:	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Black	11	11	12	14	13	11	8	25	15	17
Hispanic	7	4	6	4	2	4	5	10	8	7
White	20	35	18	28	26	27	27	53	39	15
Other	0	1	0	0	0	0	1	1	3	6
Total:	38	51	36	46	41	42	41	89	65	45

Table 4. 1996-2005 Deaths Related to Cocaine – Among Age Groups

Age:	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
0-19	2	3	1	2	1	2	2	6	6	1
20-29	10	9	6	13	8	6	8	15	14	11
30-39	16	20	14	14	19	14	13	22	14	11
40-49	6	15	13	12	9	15	15	31	18	15
50-59	4	3	2	4	4	4	3	14	12	7
60-69	0	1	0	1	0	1	0	1	1	0
70-79	0	0	0	0	0	0	0	0	0	0
80+	0	0	0	0	0	0	0	0	0	0
Total:	38	51	36	46	41	42	41	89	65	45

While there was no pattern observed by way of increased abuse of cocaine over the ten year period, the following was noted:

- Males have abused (76.9%) over females (23.2%).
- Abuse among races indicated whites predominately abusing (58.2%), followed by blacks (27.7%) and Hispanics (11.5%).
- Among the age groups studied, predominately it is 30-30yr. (31.7%), followed by 40-49yr. (30.1%) and 20-29 (20.2%).

Cocaine, Cocaine Abuse, Socioeconomic Status

D43 The “Jane Doe” Homicide - April 8, 1954, Boulder, Colorado

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On 8 April 1954, the nude body of a female was found by two Colorado University students along a creek bed in Sunshine Canyon outside of Boulder, Colorado. There was considerable decomposition and scavenger activity to preclude identification. The autopsy cause of death was essentially blunt force trauma. She was buried as a “Jane Doe” in Boulder’s Columbia Cemetery.

Fifty years later, the Vidocq Society of Philadelphia was asked for assistance in analysis and identification of the case. Two pathologists and an anthropologist exhumed the body and examined the skeletal remains.

Pictures: exhumation, remains, subsequent studies, facial reconstruction and law enforcement officers investigation, etc.

Decomposition, Exhumation, Identification

D44 An Overview of Elder Abuse With Assessment Tools for Medical and Law Enforcement Personnel

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After attending this presentation, attendees will understand the fundamentals of elder abuse, the characteristic patterns of injury consistent with the pathology of the human body in the aging process, and the necessary assessment tools for the proper identification of elder abuse as opposed to natural injury patterns.

This presentation will impact the forensic community and/or humanity by serving as a reference for the proper assessment of elder abuse by all medical and law enforcement personnel. In addition advocacy for the elder population in the American society will be stressed as to promote their safety.

Elder abuse encompasses a wide array of human mistreatment including emotional abuse, psychological manipulation, neglect and/or abandonment, and financial exploitation. Statistics show that in most cases, the abuse performed is carried out by a loved one or by persons' in which the victim has entrusted. A proper assessment is crucial for two reasons. First, the victim deserves to have the truth heard if a crime was in fact committed. Second, the perpetrator deserves equality and justice until it is determined that they have participated in the crime. Since some cases of elder abuse are misleading due to natural or accidental causes, it may be the case that the suspected perpetrator is innocent of the allegations.

Assessment tools for law enforcement and medical personnel include more than basic visual considerations. The word of the victim is the most considerable tool for assessing a possible crime; however, some victims are fearful to voice their concerns due to the possibility of more severe punishment by the abuser for doing so. It is then up to the investigative personnel to manage the situation for the benefit of the victim. Not only must a thorough physical assessment be completed, but also a psychological exam of both the victim and the accused perpetrator. It is also recommended that assessments be completed also upon the possibility of elder abuse. Data suggests that a personal interview of the possible perpetrator will ensure the physical and psychological safety for both parties involved by recognizing the possibility of a crime before it is committed.

Research on the topic of elder abuse will be gathered with the assistance of government officials and medical personnel familiar with the subject. Cases of elder abuse will be profiled to help identify a number of trends. First, a regional comparison within the state of Nebraska on elder abuse in small rural communities versus large cities will be examined to possibly provide helpful resources to other demographical areas of the country. This research will compare reported cases of elder abuse between different levels of population density to observe both similarities and differences in the likelihood of the crime based upon population concentration. Second, the circumstances surrounding the crimes will be compared to the injury patterns found. This information will assist law enforcement and medical personnel in determining criminal activity as opposed to an accidental death. The physical aspect of violence against the elderly, including obvious bodily harm and sexual assault, must be carefully assessed in order to determine whether the pattern of injury is accidental or inflicted by a second party. The natural aging process must also be taken into consideration upon physical assessment so as to not confuse normal physiological changes with the pathophysiological aspects of injury pattern in the elderly. Finally, trends will be compared surrounding the personal lives of the

victims' within the cases studied. These trends will be comprised of personal relationships, personal demographics, and lifestyle aspects. This will serve as an interpersonal assessment tool for all personnel assisting elderly persons at risk for abuse by giving situational data to assess for in the future.

Elder, Abuse, Assessment

D45 Atypical Wounding Patterns Caused by Rocket Propelled Grenades

Joyce P. Williams, RN, MFSA, and Michael Godwin, BS*, Armed Forces Medical Examiner System, 1413 Research Boulevard, Building 102, Rockville, MD 20850*

After attending this presentation, attendees will understand atypical wounding patterns resulting from the rocket propelled grenade.

This presentation will impact the forensic community and/or humanity by demonstrating how not all wounding patterns of grenades result in explosive injury patterns. This poster describes unusual wounds resulting from the rocket propelled grenade.

Background: Shoulder fired rocket propelled grenades have proved to be a potent weapon in the continuing conflict in Iraq. It can be considered one of the most successful antitank grenade launchers ever made. The RPG 7, (Rocket Propelled Grenade), launcher is a Soviet manufactured anti-tank weapon introduced to the battlefield in 1961 to replace the previous models following several revisions. It is robust, simple, lethal and one of the most common and effective infantry weapons currently in use. It is a shoulder fired, recoilless, muzzle loading, reloadable weapon. With a shape-charge warhead it is capable of defeating armor in all known armored vehicles. Its use was noted on the battlefields of Somalia, Iraq and Afghanistan. It is found in forty countries with manufacturing carried on in at least nine countries. The RPG 7 consists of a launcher and a rocket or warhead. The warhead is loaded into the front of the launcher. The effective range is considered to be from 150 to 300 meters however 50 meters is realistic with the untrained operator or when accuracy is warranted.

RPG damage is a factor of design, velocity, and distance. The grenade travels at a rate of 295 m/s with a range of 900 to 1100 meters. The blast radius is four meters. The resulting wounds are manifested as primary, secondary, tertiary, and quaternary blast injuries, but in some case a single unique ballistic wound is observed. Typical wounding patterns result from the physical and physiological response transmitted by blast and stress waves through the body with pathophysiological alterations. The use of modern body armor provides protection to the chest and abdomen from direct and secondary blast injury. The result is fragmentation wounding patterns. Atypical wounding patterns caused by RPG's result in a ballistic appearance.

Purpose: Illustrate atypical wounding patterns of grenades with a built-in rocket propulsion system.

Design: Retrospective review of unusual cases of ballistic wounding from RPG's on the battlefield.

Sample/Setting: Examples taken from battlefield fatalities will be shown to demonstrate wounding patterns.

Results: Typical wounding mechanisms result in fragmentation due to the explosive nature of blast response. Ballistic wounds produced by RPG's are infrequent and may result in perforating wounding patterns.

Conclusion: The RPG-7 is a simple, inexpensive, and readily available weapon and poses a significant threat to soldiers on the battlefield. The effectiveness of this weapon traditionally produces explosive injuries and infrequently a ballistic injury may occur.

Grenade, Ballistic, Wounding Pattern

D46 The Effects of Fabric on Muzzle-to-Target Distance Determinations

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After attending this presentation, attendees will understand the principles and methodologies for conducting distance determinations, the use of a density model for the dispersion of gunpowder particles and fabric types, if any, which may be problematic for such examinations.

This presentation will impact the forensic community and/or humanity by providing examiners who conduct distance determinations with a documented study validating the use of standard target material for comparison to various fabric types.

Muzzle-to-target distance determinations are often requested of forensic laboratory personnel to assist investigators in their determination of what events took place at a crime scene. Clothing items, such as shirts or pants taken from the victim, are commonly contaminated with blood or other biological materials, making them unsuitable to safely use as a target material. In addition, analysts at many forensic laboratories may not be authorized to alter evidence clothing for distance determination purposes. In order to circumvent these problems, most forensic laboratories use standard testing materials for muzzle-to-target distance determinations. Typical standard testing materials include white twill jean, blue denim and white knit cloth.

The purpose of this research project was to determine whether these standard testing materials provides an accurate muzzle-to-target distance determination, regardless of the type of fabric that was involved in the shooting incident. Patterns resulting from test firing at standard target materials were analyzed and compared to patterns resulting from test firing at various fabric types. The intent was to identify specific fabric types that may not produce valid conclusions when using the standard target material when such examinations are conducted. The methodology used nine by nine (9 x 9) inch fabric targets, a Ruger Model P89 caliber 9mm Luger semiautomatic pistol and Federal brand caliber 9mm Luger cartridges loaded with 147 grain Hydra-Shok jacketed hollow point bullets. This combination was selected because it is commonly encountered in the laboratory and the ammunition provides ample dispersion of gunpowder for comparison out to a muzzle-to-target distance of approximately forty-two (42) inches. Fabrics selected provided a variety of fiber blends, thread counts and weave types that represent clothing types often encountered in the forensic laboratory. Each type of fabric was test fired at approximate muzzle-to-target distances of contact, 1 inch, 6 inches, 12 inches, 18 inches, 24 inches, and 36 inches. Visual and microscopic examinations were conducted to identify any unusual physical properties such as burning, singeing, or melting of the fabric, as well as any gunpowder particles adhering to the cloth. The dispersion of the gunpowder on the targets was rated according to density. This examination was followed by the modified griess test in order to detect a nitrite pattern on the test fired materials. Subsequently, the sodium rhodizonate test was performed to detect a lead residue pattern on the test fired materials. The patterns developed from the various fabric types were analyzed for size and density and compared to the patterns detected on the standard target materials.

Results of the comparative analysis on each of the fabric types and indicate fabrics that might pose a problem when compared to the standard target materials will be presented. The results of these experiments will identify which fabric types, if any, should not be compared to standard target materials for muzzle-to-target distance determinations.

Distance Determination, Fabric, Gunpowder Residue

D47 Operational Issues With Forensic Light Sources: A Comparison of Effectiveness for Semen Identification

John J. Doyle, MS, University of New Haven, 191 Wooster Street, Apartment 3A, New Haven, CT 06511; Jillian Byrd, BS*, University of New Haven, 361 Alden Avenue Apartment B1, New Haven, CT 06515; and Henry C. Lee, PhD, Timothy M. Palmbach, JD, MLS, and Heather M. Coyle, PhD, University of New Haven, 300 Boston Post Road, West Haven, CT 06516*

After attending this presentation, attendees will have a greater awareness of the training required for alternate light source operation.

This presentation will impact the forensic community and/or humanity by demonstrating how critical alternate light source operation is for effective evidentiary discovery at a crime scene.

Unadulterated semen samples were placed on 5 by 7 inch pieces of white cotton in 100% and 1% concentrations to simulate a more realistic range of sample types that might be observed at crime scenes. The samples were viewed using a Mini Crimescope, an Omni Chrome, an UltraLite, and an Inova X5 unit at 300-400 nm and 435-470 nm with an Evident orange barrier filter. Two issues became paramount to the comparison: the use of different wavelengths for each color of light, and the utilization of conventional bulbs versus LEDs. Research indicated units using a range of UV wavelengths (300- 400 nm) produced less fluorescence than units that employed a fixed UV wavelength (i.e. 400 nm). Photographic evidence showed neither conventional bulbs nor LEDs held any distinct advantage.

Distance was evaluated by viewing and photographing both semen samples at 300-400 nm and 435-470 nm from 3 inches to 10 feet; photographing is not recommended beyond 8 feet. Results found distance was negligible for 100% specimens. However the 1% specimens were saturated by the light beam at 3 inches, subsequently drowning out the stain. By increasing the illumination distance, the 1% sample gradually faded and eventually became non-visible between 8 to 10 feet. At 36 inches the 100% sample was most easily viewed at 435-470 nm, whereas the 1% sample was most easily viewed at 300-400 nm, with optimal viewing at 1 to 3 feet for both samples. This illustrates the need to test various wavelengths with an evidentiary sample to maximize viewing effectiveness.

Viewing contrasts for 100% and 1% semen samples were examined using the Mini Crimescope and the UltraLite units with Evident, Melles Griot, and Tiffen orange filters at 300-400 nm, and 435-470 nm. The Evident plate provided optimal contrast for the 100% and 1% sample under 435-470 nm by creating a bright fluorescence on a dark substrate; this held true with both the Mini Crimescope and the UltraLite units. It is interesting to note the 100% sample viewed at 435-470 nm with the Tiffen orange filter provided better *color* contrast by creating an orange fluorescence and making the white cotton substrate appear blue. At 300-400 nm, the Evident and Tiffen filter provided equal contrast for the 1% sample using both the Mini Crimescope and UltraLite units. All filters provided equal contrast for the 100% sample viewed at 300-400 nm using the UltraLite, however Evident and Tiffen filters were equally favorable using the Mini Crimescope. An additional point of interest regarding wavelength and barrier combination was the manufacturer recommendation of using clear barrier goggles with a 300-400 nm wavelength. Contrary to the recommendation, results favored an orange filter for wavelengths between 300-515 nm.

A laboratory study of the practical application of forensic light sources with regard to common usage errors during evidence recovery will be presented. It is the opinion of the authors that comprehensive training be encouraged to troubleshoot the aforementioned issues, as well as any unforeseen circumstances that may arise.

Alternate Light Source, Barrier Filter, Fluorescence

D48 Ion Mobility Spectrometry for the Rapid Field Identification of Pharmaceuticals

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After attending this presentation, attendees will be briefed on a method for identification of unknown pills, detection of narcotics using a table top detector. After viewing this presentation, attendees will have an appreciation of the usefulness of Ion Mobility Spectrometry (IMS) as a tool for identification of unknown pharmaceuticals to distinguish different formulations and differentiate between excipients and active ingredients.

This presentation will impact the forensic community and/or humanity by demonstrating a possible new method for identification of unknown pills, detection of illicit narcotics is examined and showing the usefulness of IMS in identification of pharmaceuticals.

Development of analytical techniques for the field identification of illicit narcotics and prescription medications that are being abused or counterfeited is an area of interest to many law enforcement agencies. In particular, the illicit use of pharmaceuticals is a growing problem in the US. Ion mobility spectrometry (IMS) is a possible candidate for this type of analysis offering ease of use, rapid analysis times and low detection limits for a variety of pharmaceuticals. In this work, the feasibility of using tabletop IMS instruments for drug detection was investigated using commercially available IMS detection systems. A variety of over-the-counter and prescription medications, taken from the most current list of best-selling pharmaceuticals and ones known to cause false positives on field tests for narcotics, were analyzed and reference spectra were obtained and characteristic peaks were identified. The analysis was performed by taking a swipe of the surface of the pill using the manufacturer recommended swipes, which are directly inserted into the instrument, with no need for liquid extractions or any other sample preparation. When the pharmaceutical was a cream or liquid, a small amount of the material was spread on the swipe and inserted into the instrument. The instruments are so sensitive that it can detect amounts in the low nanograms of material. Because of the instruments high sensitivity, it was very easy to add too much material which would necessitate a long time between samples to clear the instrument. To minimize the effect of local environmental conditions, reference peak values were corrected for the local temperature and barometric pressure producing what are called reduced mobility values. Interestingly, many of the commercial and prescription medications give false alarms for a variety of illicit narcotics. This will require additional consideration before IMS can be used routine analysis for illicit narcotics. The ability of IMS to distinguish the active ingredients from excipients was also investigated. This may be relevant to identification of counterfeited pharmaceuticals that may have different excipient to active ingredient ratios. Finally, the ability of IMS to distinguish formulations with different doses has been studied. This work is currently being extended to also evaluate the detection of pharmaceuticals using walk thru portal based IMS systems. Such systems allow high throughput screening and may be relevant for drug interdiction at borders and transportation hubs and are currently installed in a number of airports in the US and abroad.

Pharmaceuticals, Spectrometry, Analysis

D49 Trace Detection Ion Mobility Spectrometry Analysis of Illicit Narcotics

Marcela C. Najarro, MS, Abigail Lindstrom, BS, and Rhyan Maditz, National Institute of Standards and Technology, 100 Bureau Drive, Gaithersburg, MD 20899*

The goal of this presentation is to highlight the feasibility of using ion mobility spectrometry (IMS) for the rapid field identification of trace narcotics. The practical considerations addressed in the presentation should allow drug screeners to have a better understanding of ideal parameters that commercial instruments should be operated under as well as aid in the identification of sources of false positives.

This presentation will impact the forensic community and/or humanity by demonstrating how IMS is a practical tool for the rapid screening of illicit narcotics with high sensitivity. Its ability to detect particles invisible to the naked eye makes this technique ideally suited for detecting trace amounts of explosives, narcotics, and other forensic-related substances. The forensic community should have a better understanding of the environmental background levels that exist regarding drug screening as well as possible sources of false positives. Also, understand the sensitivity of the commercial instruments used to screen for drugs.

Current national priorities in homeland security have led to an unprecedented level of utilization of trace explosive detection systems for counter terrorism and law enforcement. The most commonly deployed trace explosives detectors are based on chemical analysis by ion mobility spectrometry (IMS). People who carry or handle explosives are likely to transfer residues on surfaces that they come in contact with or retain residues on their clothes. This residue contains discrete particles of explosive that can be sampled by an IMS system. Due to the low vapor pressure of most explosives (and narcotics), direct vapor sampling of these materials by IMS is problematic. Therefore, in most IMS systems, the particles collected are converted to vapor by thermally assisted desorption. IMS is essentially a molecular size analyzer, which measures the atmospheric pressure mobility of charged analyte molecules and compares them to a reference library of a known explosive and/or narcotic. Since most narcotics are efficiently detected by ion mobility spectrometry, this has raised the intriguing possibility of (dually) using the existing and widely deployed IMS explosives detection instruments as trace narcotics detection systems for interdiction of narcotics and controlled substances. Such a capability may be of particular interest to U.S. Customs and Border Patrol, the Drug Enforcement Agency (DEA), FBI, US Coast Guard and State and Local Law Enforcement.

This work highlights the ongoing research at the National Institute of Standards and Technology (NIST) aimed at determining the feasibility of using ion mobility spectrometry (IMS) for the rapid field identification of trace narcotics. A series of practical experiments measured fingerprint IMS spectra as well as the linear dynamic range and detection limits for a series of illicit narcotics including cocaine, heroin, THC, and methamphetamine. Typical detection limits for these compounds are in the range of 0.1-100ng, which corresponds to the detection of one single particle with a diameter of a few tenths of a micrometer. A multivariate parameter approach was used to determine optimal instrumental conditions for the different narcotics. Parameters explored include desorber temperature, drift/tube temperature, and inlet temperature. Due to the significant concern of determining that the target compound was correctly identified, a database was developed of false positive alarms and interferences resulting from a wide variety of over-the-counter medications, household, and personal care products. Excipients and/or diluents commonly found in street narcotics were also carefully screened to determine their effect, if any, on IMS response. In addition, practical sampling issues were studied including optimal swiping procedures for best sensitivity as well as the influence of

possible environmental background signatures that may be relevant to trace narcotics detection (for example, the widespread contamination of US currency by Cocaine). The identification and confirmation of compounds leading to false positive alarms was evaluated by using gas chromatography/mass spectrometry (GC/MS) from extracts taken from the swipes. From these experiments, it has been determined that IMS is a practical tool for the rapid screening of illicit narcotics with high sensitivity. Its ability to detect particles invisible to the naked eye makes this technique ideally suited for detecting trace amounts of explosives, narcotics, and other forensic-related substances. One significant issue of concern is the potential for a high degree of false positive alarms due to environmental background and the low resolution of the technique. This suggests that the combination of IMS with an initial separation step such as GC may be important for continued development of this approach for practical field analysis.

Illicit Narcotics, Trace Detection, Ion Mobility Spectrometry

D50 The Effect of Speed on Bloodstain Patterns Found on the Exterior of a Moving Vehicle

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After attending this presentation, attendees will learn about the minimum speed required for blood from a beating incident to exit a moving vehicle and spatter back onto its exterior.

This presentation will impact the forensic community and/or humanity by providing bloodstain pattern analysts and investigators reliable data on which they can base their interpretations or crime scene reconstructions.

When a patrol officer approached a vehicle on the side of the road, two of its occupants were standing outside claiming they got into a car accident while the third occupant lay dead in the front passenger seat. The vehicle sustained minor exterior damage; however, the observable bloodstain patterns on the exterior surface of the vehicle were inconsistent with the story. Although blood spatter interpretation has been described in vehicular crime scenes, the literature is lacking in studies illustrating blood escaping from a moving vehicle and subsequently spattering back onto the exterior frame of that vehicle. This study sought to determine the minimum speed at which blood resulting from a beating incident, would exit a moving vehicle and spatter back onto its exterior rear passenger window. A blood soaked sponge was positioned on the right scapula of a face down mannequin and placed in the front passenger seat of a sport utility vehicle (SUV). While the front passenger window was rolled down, the sponge was struck 3 times with a blunt force object while the vehicle traveled at 1 of its 5 variable speeds until the presence of blood spatter was noticeable on the rear passenger window of the SUV. Brown butcher paper covered the rear passenger window of the SUV and was used to capture the visible spatter, which was subsequently recorded and photographed. A total of 16 trials were completed, resulting in perceptible medium impact blood spatter at a minimum speed of 30 mph. This result was successfully repeated during three additional trials.

Bloodstain, Moving, Vehicle

D51 Technological Integration and How it Affects the Forensic Resource

Paul A. Smith, MSc, Chris Baber, PhD, and Barbara A. O'Donoghue, RFP, Birmingham University, MsSAM, School of Electronic, Electric and Computer Engineering, Edgbaston, Birmingham, B15 2TT, United Kingdom*

After attending this presentation, attendees will have an insight into how the forensic resource can be affected by the introduction of novel technology into the operational framework of investigative practice. Methods will be suggested which could be employed to implement novel technology within the operational infrastructure of forensic investigation.

This presentation will impact the forensic community and/or humanity by presenting an approach to integrating technology within the domain of forensic investigation, one which is based upon attaining a user centered design concept and one which provides systems level functionality. The impact of this will be the implementation of relevant, cost effective technology through understanding system requirements and thus reducing the potential for adversely affecting the quality of the forensic resource.

The quality of forensic evidence is affected by the recovery process. The effectiveness of subsequent forensic analyses and consequential examination depends on the quality of the processes employed at the recovery stage. This presentation highlights research looking at technological and methodological change to support evidence recovery and how changes affect the quality of the recovery process, and consequently, the forensic resource. A case study will be presented which will look at the effects of technological change to law enforcement agencies, particularly how the introduction of new working practices and new technologies into organizational infrastructures lead to decreases in performance, rather than the increases which were anticipated. The case offers an insight into where integration problems exist and the complexities involved in rectifying the situation. Change appears to affect the forensic performance of the crime scene investigators, and as a consequence of the perceived dip in performance, a period of modification to technological support and to the methodologies employed needs to be undertaken. Poor integration strategies can be detrimental financially and operationally, this can impact on morale and the working culture of the team. The research looked at the bureaucratic responsibilities and analyses the consequence of change to other practitioners within the investigative process. Often studies that explore change point to problems in the integration strategies; on many occasions there is a failure to consider the complex interdependencies that connect different parts of the organizational 'system'. Forensic investigation is an example of this notion, where, very often, evidential quality, or continuity, is affected by the work of others in the chain of investigative process. The process of re-description is often dependent on understanding how the system operates from beginning to end, particularly how the investigation builds and how the accumulated information is displayed and utilized throughout each stage. In this work, a simple description of such interdependencies is adopted. Understanding, attained through partnership, enables future research to be embedded in the notion of user centered approaches to designing relevant technology for matters concerning forensic science. Focusing on systems level functionality, and supporting the forensic resource through automating processes allows the crime scene investigator greater time at the scene, whilst encompassing the bureaucratic and administrative requirements of the modern police service. The information acquired throughout this research is being used to determine what is prevalent to the investigator, and consequently, others involved in the investigation. By considering the narratives used and the collaborative requirements for information management and forensic process, the data can be used to focus design on appropriate user based technology, methods to aid data capture, and connectivity to support the flow and management of pertinent information.

Technology, Crime Scene Investigation, User Centered Design

D52 Technology for Crime Scene Investigation

Paul A. Smith, MSc, Chris Baber, PhD, James Cross, PhD, and Dengel Robinson, BSc, Birmingham University, School of Electric, Electronic and Computer Engineering, Edgbaston, Birmingham, B15 2TT, United Kingdom*

After attending this presentation, attendees will have an insight into technologies being developed by researchers at the University of Birmingham to support forensic investigation. The presentation will highlight the requirements process and subsequent technology designed and developed to support the delivery of crime scene investigation and enhance the potential of the forensic resource to law enforcement agencies.

This presentation will impact the forensic community and/or humanity by introducing several concepts, incorporating wearable technology, shared analysis, augmented reality and enhancing connectivity throughout the investigative infrastructure.

To maximize the potential of the forensic resource the recovery process has to be performed in a manner that maintains the integrity of the exhibits and remain within the confines of the appropriate laws which govern evidence recovery. Providing that an adequate integration plan has been used, technology can improve the efficiency and the efficacy of the investigative process. A key issue relates to the digitization of data collected at the crime scene and the methods of connectivity utilized throughout the investigative process to disseminate and receive information. Additionally, methods of capturing pertinent data will be explored, removing the mundane aspects of paperwork, such as completing labels and logs, and also evaluating bureaucratic responsibility focusing on allowing the forensic investigator to concentrate on the scene examination. This research has focused on several aspects of technological innovation providing solutions which involve the use of wearable technology, case based reasoning, and augmented reality. The research has culminated in the participatory collaboration of domain professionals and design engineers to produce technology relevant to the domain. The technology will be presented along with responses of practitioners to the proofs of concept and prototypes. Using a technology acceptance model several designs were presented to Crime Scene Investigators in a series of workshops, the responses were measured using questionnaires, the results of which will also be presented. The research has provided an insight into how emerging novel technologies are affecting crime scene investigation and forensic process; it will also highlight the potential future for law enforcement technologies.

The results of research into technology designed to support forensic investigation will be presented. Several concepts will be introduced, incorporating wearable technology, augmented reality, and enhancing connectivity throughout the investigative infrastructure of law enforcement agencies. Pertinent issues relating to potential integration problems of novel technology will be discussed. In order to ask what affect a new technology might have on an organization, it is necessary to consider the nature of the organization, the tasks performed, and the people who will use the technology.

Crime Scene Investigation, Shared Analysis, Technology

D53 Kidnaping in Darke County: Post Offense Behavioral Analysis

James J. McNamara, MS, Behavioral Analysis Unit, NCAVC, FBI Academy, Quantico, VA 22135*

After attending this presentation, attendees will gain a better understanding of the criminal investigative analysis process. Also, how offender post offense behavior can be identified, analyzed, and used by investigators and medicolegal professionals to successfully solve cases.

This presentation will impact the forensic community and/or humanity by demonstrating how in the absence of significant crime scene/forensic evidence, or eyewitness evidence, there is another valuable tool that can help solve violent crimes: criminal investigative analysis. In this presentation the emphasis is specifically focused on offender post offense behavior, how it can be identified, analyzed, and used proactively to bring about a successful resolution to a case.

The purpose of this presentation is to provide investigators and medicolegal professionals with a better understanding of criminal investigative analysis as a tool in the resolution of violent crime investigations. This presentation will be highlighted with a case example involving an abduction/rape/murder in which there was no forensic evidence, a minimal crime scene and no eyewitnesses. The utilization of post offense behavioral analysis proved key in the resolution of this murder case.

The FBI's NCAVC is routinely consulted by federal, state, local and international authorities in a variety of cases involving violent crimes, especially sexually motivated homicides. The NCAVC has extensive experience in assisting federal, state, local and international law enforcement agencies in the analysis and investigation of sexually motivated murders, and has reviewed hundreds of sexual homicides for research purposes.

This presentation will demonstrate the value of criminal investigative analysis as a valuable tool by demonstrating how case detectives used a behavioral analysis provided by the NCAVC, specifically for their case, that focused on the offender's post offense behavior. The resulting investigative strategy provided by the NCAVC and the investigative work done by the case detectives, successfully resolved the case.

Upon completion of this presentation attendees can expect to have a greater understanding of criminal investigative analysis, offender post offense behavior and how it can be used effectively by investigators, especially in the absence of forensic or eyewitness evidence.

Post Offense Behavior, Behavioral Analysis, Sexual Murder

D54 Missing in Madison, Wisconsin: A False Allegation Abduction

James J. McNamara, MS, Behavioral Analysis Unit, NCAVC, FBI Academy, Quantico, VA 22135*

After attending this presentation, attendees will gain an understanding of false allegation crimes, the offenders who commit false allegation crimes and their motivation.

This presentation will impact the forensic community and/or humanity by providing a better understanding of false allegation crimes and providing information for better identifying, analyzing, and investigating false allegation crimes.

The purpose of this presentation is to provide investigators and medicolegal professionals with an understanding of false allegation crimes, the offenders who commit false allegation crimes and their motives as highlighted through a case example involving a false allegation adult abduction. This presentation will discuss false allegation crime and its parameters, motivation of the offender, forensic and investigative issues.

False allegations are an enormous burden to law enforcement. They consume time, money and manpower as well as generating frustration within the law enforcement agency and the community they occur in. If unresolved, they can cause the public appearance of failure by the police. The FBI's NCAVC is routinely consulted by federal, state, local and international authorities in a variety of cases involving violent crimes, to include false allegations. The NCAVC has extensive experience in assisting these various law enforcement agencies in the analysis and investigation of false allegation crimes, to include rape,

stalking, extortion, and abduction. The focus of this presentation is on the practical issues involved in investigating and analyzing a false allegation crime, and the benefits of input from a multi-disciplinary approach and the need for cooperation between professionals.

Upon completion of this presentation, attendees can expect to have a greater understanding of the “truth” about false allegation crimes, to include the differences between genuine and false victims, false allegation versus unfounded cases, and motivations of the offenders.

False Allegation, Factitious Disorder, Abduction

D55 False Allegation of Child Abduction

Mark A. Hiltz, BA, Kathleen E Canning, MS, and Yvonne E. Muirhead, MS, FBI, FBI Academy, Quantico, VA 22135*

After attending this presentation, attendees will have a better understanding of the dynamics and characteristics of child homicide cases in which the offender has reported the child as missing or kidnapped in order to cover up their involvement in the child’s death.

This presentation will impact the forensic community and/or humanity by demonstrating that one of the issues to be resolved in almost every missing child case is whether or not the parent(s) or some other person close to the victim is actually responsible for their disappearance. In the absence of a witnessed abduction or definitive forensic evidence it is often difficult to make that determination. The research project that this presentation is based upon is intended to provide insight into the dynamics and characteristics of these types of cases and direction to the law enforcement community responsible for their investigation.

The purpose of this presentation is to provide a better understanding of the dynamics and characteristics of false allegation of child abduction cases.

Parents and other caregivers are sometimes responsible for killing children who are under their care, and then falsely alleging that the child is missing, or has been abducted, in order to explain the child’s disappearance and/or to cover up their complicity in the crime. These cases cause significant problems for the law enforcement agencies charged with their investigation, inasmuch as, absent witnesses or definitive forensic evidence, it is difficult to distinguish between a valid kidnapping and a false allegation.

The FBI’s National Center for the Analysis of Violent Crime initiated a research project into these types of cases in order to gain a better understanding of the dynamics of false allegation cases, identify characteristics of these cases and how they may differ from true kidnapping cases, and to identify successful investigative strategies. Forty-nine (49) cases have been examined to date, and the key findings will be discussed during this presentation.

Child Abduction, False Allegation, Child Homicide

D56 How Women Victims of Intimate Partner Violence are Portrayed in International Medical Journals: A Study of Articles Published Over the Course of a Year

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The goal of this presentation is to encourage practitioners to reconsider how they treat women victims of intimate partner violence, that they might treat such patients with more respect for their autonomy.

This presentation will impact the forensic community and/or humanity by encouraging clinical research in this field and potential research partnerships.

Introduction: Intimate partner violence (IPV) is officially considered to be a ‘public health problem’ in France as stated in a government report published in 2000. Resources are being coordinated to assist doctors in the assessment, documentation, treatment, and appropriate referral of the women victims concerned.

Objective: To determine how women victims of IPV are represented in the medical discourse.

Method: For the year 2004, referenced publications were studied on Medline selected with the key words ‘domestic violence’ or ‘intimate partner violence’. Only papers focused on heterosexual couples were considered – all other couple groups were excluded. For each paper, the nationality, specialty practice, and bias of each author were evaluated as well as the type of journal each paper was published in.

Results: There were 621,643 referenced publication papers in 2004. The search yielded 1274 references of which 298 were relevant to the study. Thirty countries were represented, with a majority of the articles from the USA. Journals relating to public health, victimology, and gynaecology/obstetrics were the most present. IPV in itself is never defined but is always considered by its consequences or by the risk factors.

The publications concerned in majority the women (only 20 papers concerned the aggressor and 16 papers concerned the couple), treating mainly the epidemiological aspects, socio-demographic data, risk factors, and the consequences for the women’s health and that of the children.

The recommended therapeutic attitude always involves invoking judicial procedures.

Discussion: IPV seems to be mainly considered through the demographic data, and the absence is remarkable, in this series of papers at least, of clinical case studies which would allow to better understanding what goes on in the intimacy of violent couples. The woman is considered in isolation, completely passive, and not as part of a couple. No publication distinguishes between forced marriages and freely consented marriages. The woman is presented as fragile, incapable of asserting herself, who requires not only guidance but also, often, assistance.

In France, a debate has begun between those who consider the women as victims and those who have reconsidered this approach.

Conclusion: The medical publications studied give only an unclear image of the women, made up of statistical data, with a tendency to consider women victims of IPV as persons without autonomy, based on more or less relevant psychological data. In the series of papers studied, the lack of serious clinical case studies of persons concerned by IPV is notable. Progress can only come about through a considerable number of well researched case studies

Intimate Partner Violence, Women’s Status, Autonomy

D57 Revisiting the Groth/FBI Rapist Typologies: What Do Empirical Studies Have to Add?

Lynn F. Monahan, PhD, and James M. Adcock, PhD, Department of Criminal Justice, University of New Haven, 300 Boston Post Road, West Haven, CT 06516*

After attending this presentation, attendees will gain understanding of additional factors to consider in relation to rapist motivation and behavior.

This presentation will impact the forensic community and/or humanity by increasing appreciation for contribution of “academic” research to practical problems in forensic investigation.

Investigators of violent sexual crime have long been interested in a method of classifying rapists that could identify possible directions for the investigation. In the 1970s Nicholas Groth (1979) developed what could be called a behavior/motivation-based typology, based on his work with incarcerated offenders. This was further refined by Hazelwood & Burgess (1987) and is currently one of the more frequently used rapist typology systems in the United States. The system includes four categories: 1) power reassurance 2) power assertive, 3) anger retaliatory and 4) anger excitation. Corroboration of this typology has been based on case studies of incarcerated offenders and investigators' professional experience. From a research methodology viewpoint, this would be described as "qualitative" research.

Recently, there have been a number of studies in the US, Australia and England, which have used "quantitative" approaches insofar as they have applied multivariate statistical techniques to large data sets without using *a priori* conceptual frameworks. A variety of questions are posed in these studies such as whether or not there is behavioral consistency by a single offender across offenses, to what extent a particular rapist group correlates with demographic characteristics such as age and race, and which crime scene characteristics cluster together.

The purpose of this paper was to conduct a "meta-analysis" by comparing the quantitative research findings to the "Groth/FBI typology" to determine the extent to which the case study and large scale data analyses supported one another. At the time of this abstract submission, the full analysis has not been completed. However, preliminary results indicate that there is some behavioral consistency across offenses, some support for the four rapist groupings, particularly for the anger retaliatory and anger excitation categories. There is also some evidence of overlap between categories and the importance of "dynamic" factors such as victim behavior, environment, and drug/alcohol use in determining the characteristics of the rape process is likely to have been underestimated.

Rapist, Typology, Research

D58 Intimate Femicide, Accident or Natural Death

Bonita M. Porter, MD, and Michael S. Pollanen, PhD, MD, Office of the Chief Coroner, 26 Grenville Street, Toronto, Ontario M7A 2G9, Canada*

After attending this presentation, attendees will understand the importance of keeping an open mind when investigating sudden and unexpected deaths of women in the presence of their intimate partners will be discussed.

This presentation will impact the forensic community and/or humanity by demonstrating how a detailed case investigation and appreciation of the pathological evidence of disease processes can prevent a miscarriage of justice.

This investigation was initiated by a call to 911 at 5:24 am from a resident living in an upscale cottage community in Ontario. The residence was well known to police due to frequent complaints from the neighbors about the dogs barking.

A male reported finding his wife lying unresponsive on the living room floor. Emergency personal arrived on the scene to find the house in disarray. A woman was lying face down on the floor in front of the fireplace. The embers of the fireplace were noted to be red and hot. The paramedics turned her over, assessed her to be vital signs absent and did not initiate resuscitation. Other findings included a body warm to the touch, cool extremities, dilated pupils, mild rigor, facial cyanosis, and no lividity. The woman's body was clad in a plain nightgown, which was soiled and filthy. It was stained with urine and feces. Her feet were covered in dirt and the top of her right toe was cut. There was dried blood noted on the toes on her right foot. The coroner and police

responded. Given the nature of the scene the coroner requested additional investigation.

Ten years ago in Ontario, the death of a woman, originally classified as accidental, was determined to be a homicide by her spouse who staged a motor vehicle incident. As a result, all coroners were reminded of the importance of comprehensive investigations of unexpected female deaths where the only witness is a male partner. Subsequently, it also became a policy that all postmortems in cases of sudden and unexpected deaths of women in the presence of an intimate partner be conducted by a Regional Coroner's Pathologist, (a special designation by the Office of the Chief Coroner).

In compliance with this policy, the body of the deceased in this case was transferred to the Forensic Pathology Unit of the Office of the Chief Coroner in Toronto. A significant finding at autopsy was 2800 cc of fluid blood present in the peritoneal cavity.

Additional investigation revealed the following information. The deceased was 52-years-of age. Her husband was twenty years older. When questioned by police, he admitted to having had a "misunderstanding" with her the day prior to her death, but denied any violence. The couple was known to be in financial difficulty. The deceased was recently charged with fraud. The husband told police they had a million dollar home elsewhere, but the deceased refused to sell it as her child lived there.

According to the husband, the couple was up until about 3:00 am. Prior to going to bed, his wife asked for assistance in getting to the bathroom. He claimed that he could not lift her, and she could not walk, so she crawled. He last saw her in the bathroom and he went off to bed. One of the dogs woke him up at 5:00 am. He let the dog out and then went to check on his wife, expecting to find her sleeping on the couch. She was lying on the floor face down and he could not wake her. He then called 911.

Positive autopsy findings included peripheral wasting, a protuberant abdomen and slightly yellow sclera. There was a small amount of dried blood on the left nostril and a 2 cm ill-defined purple-red contusion on her chin. A 3 x 0.5 cm recent abrasion/contusion was noted over the right mastoid process and there were multiple red-purple contusions over the anterior surfaces of the shins. Fading purple contusions were noted over the arms. Fluid blood (2800 cc) was found in the peritoneal cavity.

Was this a death from natural causes, an accident, or foul play? The source of the hemoperitoneum will be revealed during the presentation.

Femicide, Investigation, Hemoperitoneum

D59 Predictors of Rape Associated With Injury in Adolescent and Adult Women

Patricia A. Crane, PhD, MSN, Child Abuse and Forensic Services, Inc., 810 Hospital Drive, Suite 190, Beaumont, TX 77701*

After attending this presentation, attendees will understand the importance of data collection in rape research, the significance of secondary data analysis in predictive model analysis, and implications for future rape research.

This presentation will impact the forensic community and/or humanity by demonstrating the value of data collection and research with rape victims of different ethnicities in various locations in the USA and is an initial step in model building for prediction of injury.

The purpose of the study was to identify predictors of physical injury (setting, victim characteristics, and forensic characteristics) in females over 12 years of age, adolescent and adult women, who have a medical history of rape by a male perpetrator and are examined in the emergency Department (ED). Severity of rape-related injury is linked to negative health consequences. Understanding the impact of injury severity and the associated predictors expands knowledge of the

experience of rape and women who are at greatest risk for long-term negative health consequences. Variables included regional setting, victim characteristics (age, ethnicity, and known or unknown perpetrator) and forensic characteristics (time from rape to examination, weapon presence, multiple perpetrators, and use of an evidence kit). Secondary data were evaluated that were cross-sectional retrospective clinical documentation of forensic examinations of women (n = 3318) 13 to 89 years of age (mean age 26.6; SD = 11.1) from three diverse regions of the US: the northeast, the southern coast, and the west coast. The results of multiple logistic regression models included main and interaction effects, primarily involving setting and ethnicity variables. The forward stepwise model ($X^2 [18] = 387.26, p = .001$) demonstrated adequate fit based on the Hosmer-Lemeshow X^2 goodness-of-fit results ($X^2 [7] = 5.72, p = .57$), and was a slightly improved fit over the backward elimination model ($X^2 [22] 398.12, p = .001$), which also had desirable Hosmer-Lemeshow X^2 results ($X^2 [7] = 7.47 p = .38$). The forward and backward models included 10 significant interactions: Setting C by age, Setting C by examination time of > 72 hours, Setting A by other ethnicity, Setting A by weapon presence, Setting A by examination time of 48-72 hours, Setting A by other ethnicity, Setting A by weapon presence, Setting A by examination time of 48-72 hours, and Setting A by multiple perpetrators, age by weapon presence, African American by examination time of 24-48 hours, African American by multiple perpetrators, other ethnicity by examination time of > 72 hours, and unknown perpetrators by multiple perpetrators. Conclusions are that ethnicity and location are important variables for data collection. Implications of this research 1) lead to refinement of data collection, 2) address the need for initiating research in the acute time frame, 3) inform tailored interventions for diverse victims, 4) link health and legal systems to improve overall forensic management of victims, 5) emphasize the need for multi-level funding allocation of resources for education, prevention and interventions to improve victim care.

Rape, Research, Violence Against Women

D60 Suspect Exams in Sexual Assault: How to Catch the Bad Guys

Melodie A. Brooks, BSN, YWCA of Toledo, 1018 Jefferson Avenue, Toledo, OH 43604; and Julie Cox, BS, Ohio Bureau of Criminal Identification and Investigation, 1616 East Wooster, #18, Bowling Green, OH 43402*

After attending this presentation, attendees will be able to identify the purpose and necessity of suspect exams, the correlation of suspect exams to sexual assault investigations, and the required elements of a suspect kit.

This presentation will impact the forensic community and/or humanity by raising awareness of the necessity for suspect evidence collection when investigating sexual assault cases.

Traditionally evidence collection has focused solely on the victim by specialized forensic examiners negating the fact that valuable trace evidence maybe found on the suspect. The suspect is a crime scene as much as the victim. Although, in many cases, no forensic evidence is found on the victim, evidence collection continues to focus exclusively on the victim. Within the context of a sexual assault kit the type of evidence collected may include clothing, bedding, and stains. These items when collected appropriately and transferred into evidence correctly can place the suspect at the scene of the crime. Other cases may involve digital penetration, oral penetration or the use of condoms in the assault. The type of trace evidence collected from these situations can be the key to success in an investigation and may only contain DNA from the suspect. Many forensic nurse examiner programs have collaborated with municipalities to provide evidence collection on the suspects of these crimes. The evidence collected on suspects can help corroborate a victim's account of events and complete the link between

crime scene, victim, and suspect. In contrast, the collection of evidence from a suspect can assist in the individual's exoneration. Suspect exams are not limited to sexual assault cases. In many scenarios, bite marks and fingernail scrapings can prove to be an invaluable source of DNA from the perpetrator of a crime. Furthermore, the suspects clothing can reveal an unrealized source of DNA. The timing of suspect evidence collection is crucial. The evidence on hands, clothing, or body parts can be washed away and lost forever. Juries continue to place demands on the forensic community to provide DNA. Through the development and initiation of suspect exams this demand maybe fulfilled.

Case studies where suspect evidence was pivotal in the investigation and prosecution of sexual assault. Emphasis will be placed on the key elements of correlation between the victim and suspect DNA will be presented. The suspect kit components will be reviewed with significance placed on types of evidence that maybe collected. A sample policy and procedure will be reviewed and available for distribution. In addition, participants will receive a sample consent form for review. The presentation is focused on information required to establish suspect collection.

Suspect Exam, Trace Evidence, Sexual Assault

D61 Male Sexual Assault: Fifteen Years Later What Has Changed?

Diana K. Faugno, MSN, 1351 Heritage Court, Escondido, CA 92027; and Patricia M. Speck, RN, PhD, UTHSC College of Nursing, 877 Madison Avenue, Room 653, Memphis, TN 38163*

After attending this presentation, attendees will be able to state two myths surrounding male sexual assault and list two vital factors to be included when reporting male sexual assault.

This presentation will impact the forensic community by assisting the attendee in exploring ways to obtain the history of a male victim of sexual assault in the Emergency Department or other setting when they present with physical or emotional injury associated with sexual assault. Currently most information about sexual assault relates only to the female victim. The attendee will become familiar with strategies for interacting with male sexual assault victims.-

The historical perspective about male sexual assault shows abduction and assault of males recorded in Greek mythology and during ancient Roman times. This type of assault signaled total defeat of the male. Males who were penetrated were considered to have lost their manhood and could no longer be a warrior or ruler. Gang rape was the ultimate punishment Romans used for adultery. The Persians and Iranians used male sexual assault for violation of sanctity of the harem.

Male sexual assault is extremely underreported. The National Forensic Protocol (2004) states that one out of every six males will be sexually assaulted. There continues to be multiple myths that support the non-reporting of male sexual assault that plague society.

Male sexual assault has a higher incidence of physical injury that ranges from 13-57% as compared to 10-37% in females. Males are more likely to be beaten than female sexual assault victims. More than 80% of male victims are heterosexual. One of the biggest fears from men after the sexual assault is that they really are homosexual because only gay men would get raped. Another barrier to reporting sexual assault is the high drug use in this population. Males do not want to report the rape because they also have been using drugs and do not wish to disclose this factor to law enforcement along with the report of sexual assault. Male victims are also young and may not be aware of services to help them.

This presentation will review other myths and reasons why males may not report sexual assault. Data collected from over 3,000 sexual assaults of both genders will be explored and discussed. This data will look at the ages of the male victims and race of males, who have reported sexual assault as well as the relationship to the perpetrator. Victim characteristics will also be explored from the data analysis.

Perpetrators are aware how erection and ejaculation confuse the male and they will frequently tell the victim they enjoyed it because they had an erection. They will discourage the male from reporting. This gives the perpetrator an increased sense of control in this crime.

Psychological impact also affects this population with a higher incidence of mental health issues such as depression requiring medication.

Barriers to health care, psychological issues and treatment will be discussed along with a review of current literature in the field of male sexual assault. Several case studies of medical findings in male sexual assault will be presented as well. Key points and best practices will be highlighted for application by attendees in their clinical settings.

Male Sexual Assault, Rape, Sexual Assault Database

D62 A Comprehensive Competency-Based Process for the Recruitment of Forensic Scientists

Jack Laird, MS, Johanne Almer, MS, Roger Frappier, MS, Andrew Greenfield, MS, Cecilia Hageman, PhD, and Jonathan Newman, BS, Center of Forensic Sciences, 25 Grosvenor Street, Toronto, Ontario M7A 2G8, Canada*

After attending this presentation, attendees will learn about progressive initiatives taken to strengthen the process of recruiting forensic biologists thereby ensuring the success of candidates with the skills and competencies most relevant to the position. The presentation will highlight aspects of the recruitment process including the evaluation and weighting of various components and will demonstrate how key competencies and technical skills are assessed through the selection process from the screening of applications to the job interview.

This presentation will impact the forensic community and/or humanity by demonstrating the use of effective tools and strategies to ensure the recruitment of appropriately qualified personnel into the forensic scientist position.

In the past 5 years, the Biology Section at Ontario's Centre of Forensic Sciences (CFS) has recruited over 30 biologists through annual competitions. The process, while aligned with Government of Ontario hiring standards, has evolved to a rigorous assessment of skills and competencies¹. The forensic biologist position is responsible for managing scientific examinations in criminal cases, and includes acting as a scientific advisor for clients, performing or overseeing the screening of evidence items for body fluids, interpreting and reporting the results of both body fluid and DNA results, and providing expert testimony when required.

Between 200 and 300 applications are received for each competition. Applicants are selected for scrutiny on the strength of their cover letter and CV, insofar as it is aligned with the key qualifications of the position outlined in the job advertisement. Short-listed candidates are further screened through the on-site administration of a two-hour invigilated technical examination, assessing the underlying theoretical knowledge required during the application of all aspects of body fluid and DNA analysis. Only the top performers are subsequently invited to interview – at least three candidates are interviewed for each available position.

The interview is comprised of multiple components, in the following sequence, lasting a total of 3 hours.

• **Panel questions:** A three-member panel asks a series of questions, requiring the candidate to demonstrate examples of key competencies through reference to past behavior. This component focuses less on technical knowledge than on behavioral competencies.

• **Candidate oral presentation - with supporting tools:** Candidates are asked to prepare a 10-minute, time-limited PowerPoint presentation summarizing the key messages from a published paper

concerning applicable research, sent to them a week ahead of time. This component establishes whether the candidate is capable of synthesizing a paper's technical content into a clear, concise, and effective presentation using a common software application. Candidates are also asked follow-up questions, dealing with the practical application of the paper's findings.

• **Candidate oral presentation – no supporting tools:** Candidates are sent a question regarding the field of forensic biology one week prior to the interview, and are asked to prepare a 10-minute, time-limited oral response with no visual aids or supporting notes. This component establishes whether the candidate is capable of researching the salient points required of the response and of conveying these effectively through clear, unassisted communication.

• **Mock case consultation role-play exercise:** The candidate is asked to play the role of a forensic biologist, and the interview panelists assume the roles of a regional supervising coroner, a police investigator, and a police forensic identification officer in the very early stages of a high-profile homicide investigation where the perpetrator remains at large. A case conference is held and in a dynamic and highly interactive process, the scientist is called upon to provide advice and guidance with respect to what scientific examinations may be undertaken. Additionally, the scientist is asked to prioritize the examinations and to commit to particular turnaround times, given immediate public safety concerns expressed by the police.

This component demonstrates the candidate's ability to establish and maintain focus in a high-pressure scenario, and to distil a large volume of information into a manageable and effective action plan that meets the needs of customers.

• **Court role-play exercise:** Candidates are provided with a brief case history, a sample of basic analytical data, and a report detailing basic forensic findings and conclusions. They are asked to adopt these materials as their own case file and are given 15 minutes to review them in preparation for a mock court.

During the mock court, the candidate is asked to 'take the stand' in their capacity as an expert witness, while members of the panel assume the roles of judge, crown attorney, and defense counsel.

This component assesses the technical substance of answers to scripted questions dealing with the significance of results and aspects of quality assurance, as well as their style, objectivity, clarity, and simplicity.

The elements described above provide a sound basis for critically evaluating a candidate's potential for fulfilling the demanding role of the forensic scientist. Each new competition involves different questions/scenarios, while consistently targeting the appropriate competencies. While many candidates will not have the requisite experience and training to immediately act at the level of the position which the selection process contemplates, it is nevertheless structured to identify those with the key competencies and the technical acumen that combine as the foundation for the development of an excellent forensic scientist.

¹ Jones, GP and S. Moore. 2001. A Behaviour Competency Model (BCM) for Forensic Scientists. Proceedings of the 53rd Annual Meeting of the AAFS, p. 130.

Forensic Scientist, Recruitment, Behavioral Competency

D63 The Need for Training in Forensic Science

Samantha L. Huffman, BS, BA, West Virginia University Forensic Science Initiative, University Services Center, Suite 3102, 3040 University Avenue, PO Box 6217, Morgantown, West Virginia 26506-6217*

After attending this presentation, attendees will understand that the need for training and continuing education in forensic science is important for professional development.

This presentation will impact the forensic community and/or humanity by providing the forensic community with information about the need for training practitioners in the field of forensic science.

Training was identified as a significant area of need within the forensic science community in National Institute of Justice's (NIJ) *Forensic Sciences: Review of Status and Needs* (1999). Continuing education is important for professional development. It allows the forensic scientist to maintain and update specific knowledge and skills in methods, technology, and equipment.

In forensic science there is no standard for required training once employed. Several scientific and technical working groups recommend minimum mandatory contact hours of training for specific areas of forensics. Some accreditation and certificate programs have certain standards for training that the forensic scientist or laboratory have to maintain. Without mandatory training standards for all forensic scientists, some agencies and laboratories have established their own requirements regarding training. The legal and medical professions require continuing education in order to maintain their licenses to practice law or medicine. Both legal and medical professions must meet certain criteria of continuing education on an annual basis in order to continue working in their field.

Funding for training is at issue with most agencies' diminishing budgets. The recommended budget for training is 1-3% of the total laboratory budget which is on average \$1.3 million for publicly funded crime labs. Some labs have allotted \$1000-\$1500 per year for each person for training or continuing education. According to the Bureau of Justice Statistics (BJS), *Census of Publicly Funded Forensic Crime Laboratories* (2002), the budget for training is less than 1% of the overall laboratory budgets. Even when laboratories do have the funding for training, they lack the personnel to cover the person who is away for training. A few agencies see training as a reward to the scientist and not a need to continue his or her professional development. Worse, some view training as an opportunity for the employee to travel and have fun, not to improve their skills.

Job retention in forensic science is affected by training or the lack of. In some cases, agencies will expend time and resources to train a new employee but when the training is complete, the employee leaves for a position with better pay, benefits, or for personal reasons. Agencies which do not post entry-level positions exacerbate this problem. Conversely, the newly-hired analyst receives little to no training and leaves for a position that provides training.

There has been some assistance with funding for training. With award programs from the NIJ, the Forensic Resource Network (FRN) has provided free continuing education to the forensic science community. Workshops, short courses, symposia are offered to state and local forensic laboratories at little or no cost.

Training, Continuing Education, Standards

D64 Online Sexual Assault Examiner Training: Inaugural Venture in Forensic Education

Constance A. Hoyt, MSN, 49 Birch Meadow Road, Merrimac, MA 01860*

The goal of this presentation is to demonstrate the value of an online education and training program for the preparation of nurses and physicians who desire formal preparation in the performing a forensic sexual assault examination of either victims or suspects.

This presentation will impact the forensic community and/or humanity by sharing the author's experience in creating and teaching a distance learning forensic course to train sexual assault examiners.

This presentation will discuss the development of an online educational program for preparing sexual assault examiners and outline the value of the offering, as well as clinical training issues and problems associated with the non-traditional, online course.

In 2005, the University of California, Riverside (UCR) offered the first online course designed to prepare nurses and other licensed healthcare providers to perform the forensic examination and evidence collection associated with sexual assault victims or suspects. Since this was the initial attempt within the United States to train forensic sexual assault examiners through distance learning, considerable study was done to determine the feasibility of online programming and to identify teaching strategies which would ensure that the program's content and clinical experiences compared favorably to the traditional methods for preparing sexual assault forensic examiners. The intent of the online course was to prepare sexual assault examiners for under-served communities where suitable training courses do not exist, or hardships are imposed for full-time nurses who must incur lost wages and considerable expenses for travel and housing to obtain SANE-A training.

Didactic information and clinical internship experiences were based upon the curricular content of the International Association of Forensic Nurses for the SANE-A (Sexual Assault Nurse Examiner-Adult). Curricular materials of California, Massachusetts and other selected states with well-established training programs were also benchmarked to ensure that essential concepts and principles were included, and that those completing the course would be eligible for most existing certification opportunities. However, all students were encouraged to research local and state requirements prior to enrollment, to ensure their subsequent eligibility for certification examinations in their own practice locations since requirements vary widely.

A 60-hour didactic component included demographics and theoretic aspects of sexual assault as well as comprehensive assessment and evidence collection procedures. Photography, videography, acquisition of biological specimens, forensic wound identification and documentation, use of alternative light sources, and medicolegal requirements for evidence security and chain of custody procedures essential for subsequent legal proceedings for both victims and suspected perpetrators. Essentials of working collaboratively with law enforcement, judicial authorities, and social agencies were emphasized, as well as preparation for courtroom testimony related to the forensic examination. A follow-on internship for skill validation is arranged for each student who seeks to be certified as a sexual assault nurse examiner. Course instructors assist in linking participants with appropriate professional resources within their local community. UCR and its instructors maintain oversight throughout the internship to ensure integrity and proper validation of the clinical experiences. Experiences in the internship are carefully designed to ensure that students become well-versed on prevailing local or state statutes pertinent to sexual assault. Unique requirements of the crime lab within their respective practice jurisdiction are also addressed. There are planned interactions with law enforcement, prosecuting and defense attorneys, judges, victim advocacy representatives and other personnel who are involved in various aspects of sexual assault from prevention to long-term victim follow-up. Several opportunities for observations of court proceedings are offered, and other optional experiences may be designed to meet needs of individual students.

The online SANE-A course and its unique internship permit those in remote or rural regions of the United States or other countries to obtain this education and training, and to prepare for practice within the requirements and boundaries of their jurisdictions.

Distance Learning, Online Education, Sexual Assault

D65 Developing a Forensic Science Educators Conference

Julie A. Howe, MBA, and Mary Fran Ernst, BLS*, Saint Louis University, School of Medicine; Division of Forensic Pathology, 1402 S. Grand Blvd, St. Louis, MO 63104-1028*

The goal of this presentation is to provide attendees an overview of three Forensic Science Educators' Conferences given at Saint Louis University School of Medicine. An overview of each conference, teacher survey findings to assist planning of future conferences, and lessons learned from conducting each of the three conferences will be given. It will also offer suggestions as to how to plan and conduct such a conference in your locale.

This presentation will impact the forensic community and/or humanity by discussing how to plan a successful Forensic Science Educators Conference. Survey findings will be presented as to how each conference has helped teachers develop curriculum to incorporate forensics into their chemistry, biology, or science classrooms.

In December 2000, the Third International Mathematics and Science Study was released comparing US students with those of 43 other nations. By the end of the 12th grade, the performance of US students ranked among the very lowest in math and science of the 43 countries.

This startling statistic inspired the Forensic Science Educators' Conference (FSEC) concept which would take advantage of the popularity of forensic science to increase student's interest in science and math. FSECs are developed to provide teachers the background to enrich and/or develop challenging, innovative science and math curriculums for middle and high school students.

From July 24 to 26, 2006, the third Forensic Science Educators Conference (FSEC) was conducted at Saint Louis University School of Medicine. This conference was designed to be an advanced program, spotlighting emerging forensic disciplines.

After receiving a third \$50,000 grant from the Saigh Foundation of St. Louis to provide 69 full conference scholarships to middle and high school science and math teachers; a partnership between the AAFS, Saint Louis University School of Medicine and the Saigh Foundation was rekindled.

From the experiences gleaned from two previous FSEC's at Saint Louis University School of Medicine in 2002 and 2004; it was decided to introduce the teachers to new forensic science disciplines that they might be able to incorporate into their lesson plans.

The three-day program was developed and included: How to Teach Forensic Science, Trace Evidence, Polygraphy and the Courts, the CSI Effect, Fire Science and Explosions, Patterned Evidence, Analysis of Paints, Inks and Glitter, Available Forensic Resources from the National Clearing House for Science, Technology and the Law, Roles of Forensic Scientists in Mass Disasters, Digital and Multimedia Forensic Evidence, Forensic Nursing, Accident Reconstruction, Criminal Profiling, Forensic Medicine and a Teacher's Panel. Two hours of graduate credit was provided to attendees through Saint Louis University for only \$100.

This presentation will provide attendees an overview of the conference, teacher survey findings, and lessons learned from conducting three Forensic Science Educators Conferences. It will also offer suggestions as to how to plan and conduct a Forensic Science Educators' Conference in your locale.

Forensic Education, Forensic Science Educators Conference, Survey Findings

D66 Insect Evidence Distribution: Tabulation of Primary Indicator Species, the Life Stage, and the Season of Year Used in Final Analysis From 100 Random North American Cases

Neal H. Haskell, PhD, Forensic Entomology Investigations, 425 Kannal, Rensselaer, IN 47978*

The goal of this presentation is to determine which insect species and which of their life stages impact the entomological case analysis.

This presentation will impact the forensic community and/or humanity by determining if certain insect species are predominant, and if so, to concentrate limited research funding and effort on those identified species.

One hundred random cases were selected from case files numbering nearly 700 cases over a 25 year period. The cases selected were between 1996 and 2005 with approximately 10 per year being chosen (many of these cases went to court). Distribution of the cases covered all four seasons with 20 spring cases, 43 summer cases, 23 autumn cases, and 14 winter cases, thus accounting for the many different species of calliphorids (blow flies) found over the different seasons. Geographic distribution extended from Canada (Ontario) to the southern states and from the west coast to the east coast. The insect species used in the case analysis was the primary indicator species and its oldest life stage. This means that usually one species had the oldest life stage from which to base a developmental time postmortem interval estimate as opposed to a succession based estimate where combinations of insect species are found overlapping at different days postmortem. Of the 100 cases, 89 cases used Calliphoridae (blow flies) as the primary indicator species. Two additional cases used calliphorids in combination with other insect groups. Three cases employed the Black Soldier Fly (*Hermetia illucens*), with two using sarcophagid flies, and two cases using two muscid fly genera (*Fannia* and *Synthesiomyia*). One case used the Red Legged Ham Beetle, with only one non-time of death case employing the German cockroach to explain postmortem artifacts on the remains. The most common insect life stage used for analysis was the 3rd instar larva (this includes post feeding 3rds with 52 cases where these were the primary indicator stage). Puparia were figured in the analysis in 21 cases with 5 cases using adult blow fly species seasonal distribution. A total of five cases used 2nd instar larvae, nine cases with 1st instar larvae, and two cases with nearly hatched eggs. The overwhelming majority of the cases analyzed using insects was for determining time of death (only one in this set was not). The overwhelming primary indicator insect species was the blow fly group. The most used life stage was the 3rd instar larva. This forensic entomologist has been involved with and has seen many research studies spending great amounts of time, money, and other resources in attempting to determine what decomposition stage the carrion is in, or the insect succession when recording collecting and studying the progression of decomposition through to full skeletal remains. What is shown by this tabulation is that it is not the stage of decomposition that is of importance, but the insect life stage and how long it took at what temperatures to grow to that stage. The insects were being evaluated not the corpse. Also, not one of these 100 cases was founded on successional based postmortem interval estimation, but all (except the cockroach case) were based upon developmental based postmortem interval estimations. The successional based PMI requires thousands of hours of insect identification merely to obtain the data base needed for a specific geographic area of the world. If there is plenty of funding, research personnel, and taxonomists available, then research dealing with full succession models could be warranted. However, this is not the method being used in this case work. Therefore, forensic entomologists should concentrate primarily on the life cycles, geographic distribution, and growth and development of the most commonly used primary indicator species, the Calliphoridae (Blow Flies).

Blow Fly, Life Stage, Calliphoridae

D67 International Forensic Science Center: An Innovative Approach to Forensic Science Education for Students and Practitioners

James A. Bailey, PhD, Minnesota State University, 109 Morris Hall, Mankato, MN 56001; and Nizam Peerwani, MD, and Nannepaga Y. Zachariah, PhD, Tarrant County Medical Examiner, 200 Feliks Gwozdz Place, Fort Worth, TX 76104-4919*

After attending this presentation, attendees will be apprised of the development of an innovative educational opportunity for international students and practitioners interested in advancing their forensic science knowledge utilizing the Medical Examiner's office and local forensic science resources in Tarrant County, Texas.

This presentation will impact the forensic community and/or humanity by presenting a unique pedagogical approach to non traditional educational opportunities for international students and practitioners interested in enhancing their forensic science knowledge.

The presentation will discuss the development of an International Forensic Science Center that utilizes local resources and a nontraditional curriculum designed to educate international students interested in pursuing forensic science studies. The Chief Medical Examiner in Tarrant County, Texas is developing an innovative, three-month program designed for international forensic science students and practitioners. International students may come from a range of disciplines. Some of those disciplines may include the following: pathology, chemistry, toxicology, histology, and other medicolegal specialties. The International Forensic Science Center will oversee the governance of the program and it will be administered by the administrative hierarchy of the Tarrant County Medical Examiner's Office. A program coordinator will be assigned the responsibility of directing the program and its activities. The uniqueness of the program is comprised of a combination of mentoring, apprenticeship and individually designed programs for each student. Once an international student is accepted into the program, each student will meet with the coordinator and together, they will develop a specific curriculum based on the international student's forensic science interests and the Medical Examiner's caseload. International students seeking to gain experience in forensic science would have an opportunity to examine numerous case studies at the Center.

For example, the Tarrant County Medical Examiner's Office had 1,786 ME cases in 2004. Of those cases, 881 were from natural causes, 501 were accidental deaths, 224 were suicides, 127 were homicide, and 184 cases involved human identification. The international students will be assigned to study and observe in each of the sections; however, more time will be scheduled in areas of specific interest to the student. For example, the student will be assigned to observe and interact with the death scene investigators in the field and office, the evidence intake office, and the morgue where they will observe postmortem examinations. Additionally, each student will acquire experience in the following laboratories: forensic toxicology, forensic chemistry, forensic photography, histology, human identification, firearms, and latent prints. Students will gain experience with state-of-the-art laboratory instrumentation such as the scanning electron microscope (SEM), mass spectrometry, gas chromatography, and high-pressure liquid chromatography analysis. They will also become familiar with the automated fingerprint identification system (AFIS) while working in the latent prints laboratory. Each student will work closely with a mentor in each section to ensure a positive transition from one section to the next section. Moreover, each of the mentors will be assigned to instruct the students on the essential details, procedures, and protocols in their specific section.

In addition to the laboratories, there will be a breath alcohol testing section and a trace evidence section which analyzes hair, glass, paint, and fibers. Typically, the student will be assigned one day a week in five of the eight sections for a period of three months. As part of the educational process, the student will participate in weekly staff meetings in which cases will be discussed. Students will also participate in the weekly lecture seminars with other medical examiner staff and present at least once during the course of the program. There will be flexibility in the students' subject matter selection for presentations. Typically, presentations may include such areas as drug abuse, causes of death, child abuse investigation, and other similar medicolegal topics. International students with diverse backgrounds will have the opportunity to exchange ideas with the medical examiner's staff. In addition to the forensic science section assignments, international students will have an opportunity to attend related lectures at area institutions of higher learning. After successfully completing the program, the student will be awarded a certificate of completion by the Tarrant County Chief Medical Examiner.

Forensic Science, Forensic Education, Forensic Training

D68 Teaching a Crime Scene Practicum Using Multiple Cohorts

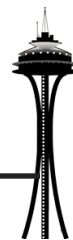
Melissa A. Connor, PhD, Dan Strydom, PhD, and Jody Meerdink, PhD, Forensic Science Program, Nebraska Wesleyan University, 5000 St. Paul Avenue, Lincoln, NE 68504*

After attending this presentation, attendees will understand (1) the objectives of teaching a crime scene practical course, (2) how to integrate student participation into the course in multiple roles, and (3) how to integrate the practicum into a forensic science curriculum.

Education in forensic science is becoming increasingly sophisticated. This presentation will impact the forensic community and/or humanity by presenting an educationally sophisticated method of integrating hands-on experience with classroom learning in a graduate forensic science curriculum.

To effectively reflect reality, a crime scene practicum must be designed to allow students to put into practice lessons learned from the classroom as well as integrating material from multiple disciplines. Students will work together as a team toward investigative goals that have been defined. The crime scene practicum developed by the Forensic Science Program at Nebraska Wesleyan University meets these goals by giving roles to each cohort going through the program. Students who are working on their master's research are assigned roles as "Faux Felons". These students, working with the faculty, design and create the scenes and work with second year students throughout the exercise. Each scene must include biological evidence, impression evidence, and evidence that reflects the behavior of the perpetrator. Students in the second year of the program investigate the scene and process the evidence. They must request reference samples for the evidence, reports from appropriate specialists (autopsy reports, odontology reports, etc.), interviews, and other information (provided by their felon), to work toward identifying a suspect and gathering enough evidence for an indictment or arrest warrant. Students in the first year of the program serve as jury members on the mock Grand Jury that ends the investigation and vote whether or not to indict each team's suspect.

Forensic Science Education, Crime Scene Practicum, Cohort Teaching



D1 Exercises to Improve Your Proficiency as a Forensic Expert Witness

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Attendees will learn four complimentary training exercises, developed at the Centre of Forensic Sciences, to improve courtroom testimony skills. The implementation of these exercises will develop individual courtroom presentation skills and abilities.

This presentation provide information regarding training exercises that can assist a forensic expert witness improve his/her competency within the witness box with respect to delivery and education of the court concerning complex scientific concepts.

The forensic expert witness must assist a court or inquiry to understand complex scientific evidence. Information incompletely or inaccurately conveyed, or not understood by the participants, is of little or no use, and may have a negative impact on the administration of justice. Answers and statements that contain insufficient information are unacceptable and those that lack clarity simply obfuscate the witness' testimony.

To develop the skills needed by a proficient forensic expert witness, the Centre offers a number of training exercises to its scientists, including:

1. Practice Court
2. Questions of Fear
3. Turnabout Court
4. Ringing the Bell

Practice Court: The Practice Court is a role-playing assignment. The scientist is given the opportunity to provide testimony using one the scientists own case files. Managers and senior scientists play the roles of Crown/Defence/Judge. It is important that these roles are filled from other sections or disciplines as often as possible, rather than that of the case scientist, as individuals in the same discipline are as familiar with the jargon and acronyms as the scientist and may not recognize the need to explain them in court.

This element compels the scientist to define or eliminate jargon and acronyms from speech – behaviors that are very important in communicating complex scientific information to a lay audience within a courtroom. With the elimination of jargon, etc., the language becomes more comprehensible to the lay audience (i.e., jury) and the officers of the court.

After the exercise, the scientist participates in a feedback session that focuses on language, demeanour, presentation, projection, clarity, knowledge, and comprehension.

Questions of Fear: The Questions of Fear exercise is often combined with a Practice Court as it targets both the reviewer's and the scientist's concerns with respect to the witness' use of terminology and clarity of information, e.g., it is important to be able to say Laser Ablation Inductively Coupled Plasma Mass Spectroscopy (LA-ICP-MS) when needed without tripping over it verbally, which appears unprofessional. The scientist must be confident on the witness stand and comfortable with the terms and concepts of his/her area of expertise in order to communicate information well and provide effective education to the court.

The scientist is charged with writing out ten questions that 1) caused him/her problems within the Practice Court exercise, or 2) he/she was glad were not asked as he/she would have had to struggle to

answer.

Each question is written on a separate piece of paper and placed into a bowl. The scientist pulls out one question per day and with instruction to answer it a single time, immediately, without any preparation – whilst looking into a mirror – and to complete the answer regardless of any verbal stumbles or inaccuracies. The exercise is repeated until the questions, phrasings and concepts are answered correctly, concisely and clearly. This exercise can quickly build up the individual's delivery skills and confidence in answering difficult questions.

Turnabout Court: Turnabout Court is an exercise in which a moderator asks senior scientific staff to answer a series of questions that submitted by junior scientific staff while all staff attends.

Two senior scientists answer each question and the answers are compared and discussed by the group. The discussions provide the junior staff with an understanding that although the core information behind an answer must be the same (accurate), explanations and delivery styles can differ as long as they are clear, correct, and concise. Personal differences are acceptable if the result is successful, i.e., the court is assisted in understanding the scientific issues.

Ringing the Bell: Ringing the Bell is an exercise specifically focussed on the use of a clear, straightforward language by the expert witness. The scientist answers questions pertaining to his/her area of expertise, asked by a senior scientist, in front of non-technical staff, e.g., secretaries or administrative support staff. These staff members ring a bell whenever the scientist uses a word that the listener does not understand or that is not explained within the answer. This forces the scientist to evaluate what is said and how it is said from the listener's perspective – a skill that is often difficult for junior staff to develop. They quickly learn how their regular phrases, words, and concepts need to be chosen carefully to impart the technical and scientific information that the court needs to understand the expert testimony.

Training, Court, Exercises

D2 Recent Research on Expert Witnesses May Help Reduce Error Rates in the Forensic Sciences

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Attendees will learn ways to minimize errors in the analysis of forensic casework, in report writing and in testimony. This presentation assist will attendees in thinking about how institutions can influence the examiners experimental work, conclusions, and report writing. Furthermore, they will learn about ways to minimize error by forensic examiners.

Reducing error rates is an important goal of research in the forensic sciences. There is an emerging field of study which deals with expert witnesses. It provides a set of tools to help practitioners in the forensic sciences reduce error rates in evaluating case work. Contributions to this field come from many disciplines, including economics, philosophy, sociology, and psychology. The authors review this literature and

discuss its importance for forensic science.

Several important themes emerge from the literature on expert witnesses. Expert witnesses are human beings and subject, therefore, to social, psychological, and economic influences. These may be considered “extraneous influences.” It is a legitimate and important scientific question to ask what extraneous influences exist and how they operate. Different researchers have proposed different and sometimes contradictory answers. The authors emphasize the notion that the institutional environment influences the significance and direction of extraneous influences. The authors argue that the influence of institutions should be of interest to forensic scientists and to managers and directors of crime labs. Researchers in forensic science should examine studies of expert witnesses to find ways of reducing error rates in forensic science evidence analysis, experimental observations, conclusions, report writing, and in testimony.

An understanding of the sources of error can help researchers understand the nature of the positive contribution that might be made by the scientific study of expert witnesses. Forensic scientists follow validated and accepted procedures in performing their analyses. However, these procedures will not generally prevent all errors. Some errors are explained by considering the procedure in the light of the underlying phenomenon being examined. These are “task-based errors.” The error derives from the nature of the task that the procedure creates. For example, a procedure requiring fingerprint examiners to match only two Galton points (and nothing else) will have a higher human identification error rate than a procedure requiring the matching of five Galton points. The lower resolution procedure produces errors because it gives the analyst the task of matching only two Galton points. Other errors are explained by considering the procedure in light of the characteristics of the examiners themselves. These are “agent-based errors.” For example, requiring traditional hair analysts to view one hair at a time would create a higher error rate than if the analyst used a comparison microscope. This difference is not attributable to any characteristics of hair, but to the limited ability of human examiners to retain in short-term memory a precise image of an examined hair. Agent-based errors may be further divided into two groups. If the error emerges even when the procedure is followed, as in the hair example, it is an “error against nature.” If the error emerges only when the procedure is not followed, it is an “error against standard.” PCR-DNA analysis can produce errors against standard because of the difficulty of adhering to its demanding protocols. By virtue of definition, all task-based errors are necessarily errors against nature.

The emerging field of study of expert witnesses provides tools for concentrating on agent-based errors, including both errors against nature and errors against standard.

Expert Witness, Quality Control, Minimizing Error

D3 Identification of Solvability Factors in Cold Case Homicide Investigation

Richard H. Walton, EdD, 800 Prospect Street, #1-E, La Jolla,
CA 92037*

Attendees will gain a further understanding of the concept of “cold case” homicides; the background of the problem and identification of the means and methods for re-activation of these cases, and how changes in relationships and technology have allowed an increasing number of these cases to now be solved.

This presentation will demonstrate the solution of cold case homicide results only from the tri-fold team effort of investigators, prosecutors, and forensic laboratory personnel. The role and

relationship of each is critical to these solutions. Changes in technology, including means and methods to process heretofore untested evidence, previously examined evidence, and the expansion of data banks such as CODIS and AFIS systems offer enormous possibilities to solve unsolved cases. Awareness and understanding of the inter-relationship required for successful cold case investigation and prosecution is necessary to successfully resolve these cases.

The objective of this presentation is to inform the forensic science audience of the results of a study designed to identify those solvability factors acknowledged by experienced homicide investigators as significantly contributing to the solution of previously investigated, yet unsolved, “cold case” homicides.

The number of unsolved murders in the United States is unknown. In the past decade, decreasing crime rates and increased forensic technology have combined to allow some law enforcement agencies the opportunity to re-investigate older, previously investigated but unsolved homicides. These cases have been dubbed by the media and public as “cold case” homicides. Groups of investigators dedicated to this facet of homicide investigation have been revealed in the literature as “cold case squads.”

This qualitative study sought to identify and examine critical solvability factors in “cold case” homicides which have been successfully solved. An interview methodology combined with supplementary document review of 20 solved “cold case” homicides and analysis of 100 additional cold case homicides previously selected by the agency for re-investigation formulated the basis for the findings of this study. Six experienced cold case homicide investigators in the Unsolved Unit of a large urban sheriff’s department participated in this study. This data was further synthesized with data resulting from examination of the systematic review utilized by the agency to assess in excess of 2,000 unsolved homicides for future re-investigation.

After attending this presentation, attendees will understand the concept of “cold case” and the background of this problem in society. Attendees will learn the various methods by which law enforcement agencies have identified their particular “cold case” problem, and the means and methods by which a cold case file may be located, reviewed, and an investigative plan formulated. Cold case homicide investigation is founded in the previous written record. On some occasions, this record does not, or never did, exist. Restoration of the case file and identification of methods that may be used in cold case investigation will inform the attendees of those factors which have been found by experienced investigators to contribute significantly to the solution of cold case homicides. In addition, attendees will be presented with means and methods to identify and recover relevant physical and biological evidence, despite the passing of decades.

The results of this study identified significant factors that contribute to the solution of cold case homicides. These factors may be construed as 1) changes in relationships and 2) advances in technology. The author will present an in-depth analysis of these factors. Changes in relationships will be explored to illustrate the psychological, human component of the reinvestigation of cold case homicides. Advances in technology and the expansion of data banks as exemplified by CODIS and AFIS databases will be discussed in depth to illustrate the expanding role of forensic science in the identification of suspects in cold case homicides. Further understanding of the role of technology and human relationships in cold case homicide investigation resulted from this study.

A paucity of research exists in the field of homicide study, and even more so in the arena of cold case homicide investigation. This research study may be the first of its kind to address this issue in the construct of an academically based study offering pragmatic results that identify applicable tools and techniques which enable law enforcement investigators and their forensic partners in the laboratory to identify, investigate, and solve unsolved, “cold case” homicides.

D4 Back-Transfer of Footwear and Tire Tread Design on Victim Clothing

Ernest D. Hamm, BA, 8628 Andaloma Street, Jacksonville, FL 32211-5013*

Attendees will learn of the possible presence of the pattern design of tire and footwear tread patterns on inside surfaces of clothing as a result of violent contact actions. The existence of this evidence may not be readily observed by the investigator and this presentation stresses a need for additional examinations to be considered in some cases.

This presentation will describe the process by which the recovery of potentially valuable investigative information through the identification of footwear, tires, and other objects involved in criminal acts such as hit-and-run accidents and aggravated assaults. This associative evidence can assist in determining the relationship of the objects with individuals.

Contact pressure on the outside surfaces of wearing apparel made by an object having a three dimensional pattern that can result in the back transfer of the object's pattern design if there is suitable transferring material present on the underlying surface such as bare skin or other layers of clothing. While the pattern transfer on the outside surface may be visible as a negative representation of the object's pattern design, the back transfer on the inside surface can be seen as a positive depiction of the design features. However, a visible contact mark may not be seen on the outside surface if there is no transferring medium on the object, but the pressure can still be sufficient to result in an inside back transfer of design features. The presence of a transferring substance on underlying surfaces can result in a pattern transfer on multiple layers of clothing. Negative and positive tire tracks may not necessarily represent corresponding contact points because of differing areas having the transferring material. In the case of tire and footwear tracks, the back transfer can provide sufficient detail of class characteristics to aid in brand identification or association with a known footwear or tire.

While this type of evidence has been associated with footwear and tires, the same type of pattern transfer could be encountered in other types of assaults in which the image or outline of a weapon could be discerned. It has also been found that some transferring substances can require subsequent enhancing techniques.

The author will show a case involving a negative tire track on a trouser leg visible because of tire tread contamination and the corresponding positive tire track from material on the victim's skin as a result of being ran over with a vehicle. There will also be illustrations of experimental trials to demonstrate the likelihood of positive and negative track representations from a single contact action on multiple layers of clothing resulting from the presence of transferring substances.

Tire Tracks, Footwear Tracks, Associative Evidence

D5 Case Study: The Uncertainty of Establishing a Postmortem (PMI) Interval Based on Entomological Evidence Incorporating the Influence of Elevation on Ambient Temperature Reconstruction

John R. Scala, PhD, WGAL, Columbia Avenue, Lancaster, PA 17603; and John R. Wallace, PhD, Millersville University, Department of Biology, Millersville, PA 17551*

The presentation will discuss a particular case study that accounts for the influence of elevation on temperature when estimating a

postmortem (PMI) interval based on entomological evidence. The authors intend to demonstrate how this environmental effect can influence a PMI estimate if not considered in the evaluation of temperature data. The attendee will learn how to incorporate elevational effects on ambient temperatures and subsequent PMI estimates based on degree day calculations with this modification to ambient temperatures.

This presentation will demonstrate that within general ecological and meteorological literature, elevation or altitudinal effects on temperature are well documented. However, little or no discussion among forensic entomologists has addressed this environmental influence on the calculation of a PMI. This particular case illustrates how failure to incorporate elevation modifications to ambient temperature can significantly underestimate a postmortem interval using insect evidence. The authors hope that forensic entomologists will recognize how elevation not only influences the established ecotone of a death scene but also impacts temperature reconstruction that is vital to reducing uncertainty on PMI estimations from insect evidence. Further, the authors hope that this case report will foster increased interactions between forensic entomologists and meteorologists.

Forensic entomologists define postmortem interval (PMI) as the period between oviposition (*i.e.*, egg laying) and the discovery of a corpse followed by preservation of recovered insect larvae. This approach rests on the fundamental relationship between insect development and the number of degree-days or thermal units accumulated over time. The comparison of average ambient temperatures with a base developmental temperature is recognized as a powerful method for estimating PMI. Several factors can influence specific insect development including individual species characteristics, weather and climate, presence or absence of maggot mass, drugs and toxins, as well as geographic domain.

A tendency exists for entomologists to act as their own meteorologist without taking into account various environmental influences which may increase the uncertainty associated with a specific PMI estimate. For example, adjustments to the temperature record are often required to account for local differences in elevation, vegetation, sun exposure, ground cover and soil type, wind, and recent weather including precipitation amount and intensity; even the rate of temperature increase or decrease may be considered important. In addition, micro-meteorological studies suggest small-scale climate forcing may produce pronounced temperature variations that are seldom captured by an observational network. These environmental influences often complicate the reconstruction of the most appropriate ambient temperature regime associated with an actual death scene.

The authors will present a case study in which the body of a young adult male was discovered near a ridgeline in steeply sloping terrain in southeastern Pennsylvania. The body was located in a heavily wooded location at an approximate elevation of 270 meters above mean sea level (MSL). The closest National Weather Service maintained weather observation station was located 14 km from the death scene at an elevation of 121 meters MSL on the property of a regional airport. Approximately 12 arthropod taxa were collected from the remains with 33 % of the identified flies of forensic importance. Post-feeding *Calliphora vicina* maggots were collected and represented the oldest identifiable insect taxon used to estimate the PMI. The final PMI was modified to include the primary influence of elevation on temperature, and secondarily, the exposure of the death scene to direct sun, angle of incidence, and slope.

Elevation, Postmortem Interval, Temperature

D6 The Investigation of Abuse in Nursing Homes

Betty L. James, RN, BSN, MA, 6822 West St. Joseph Highway, Lansing, MI 48917*

The goal of this presentation is to inform forensic scientists about abuse of residents in nursing homes by facility staff and how one state is trying to solve the problem. The presentation will impact the forensic science community and the public by examining the failure of present statutes and laws, which need to be enacted to protect the vulnerable nursing home residents from an abusive staff.

Who is protecting your loved one who resides in a nursing home? Who guards her against having her precious diamond engagement and wedding rings stolen from her finger as she sleeps? What is being done to protect her from being sexually assaulted, if she lies unconscious? Who prevents the diversion of medications meant to alleviate her pain and suffering by a thief who cares only about his own addiction? What is done to protect her from physical, psychological, or sexual abuse? Part of the solution to the above problems is to enact federal and state legislation and then enforce that legislation.

In 1990 the federal government developed a Resident's Bill of Rights. This included 37 rights to which the individual is entitled, while a resident in the nursing home. The Federal government included specific directions to the states requiring all nursing homes participating in Medicare/Medicaid to educate the resident, families and public about The Resident's Bill Of Rights. Additionally the facilities were required to provide each resident entering a nursing home a copy of the Resident's Bill of Rights and explain it in language that easily understood.

Federal Medicare/Medicaid laws, Michigan Public Health Code and Michigan Nursing Home Regulations regulate the State of Michigan nursing homes. All states have similar legislative acts.

The Federal Medicare/Medicaid regulations require an annual survey be conducted on all certified nursing homes. A team of surveyors including registered nurses, dietitians, sanitarians, and social workers spend four to five days in each facility completing seven tasks that the federal government outlined for the annual survey. In the State of Michigan, for example, federally certified surveyors from the Michigan Department of Community Health complete the surveys and investigation of complaints.

The Michigan Legislature was concerned about the number of validated complaints and convictions that the Attorney General's office processed against nursing home's staff. The legislature, in conjunction with the representatives from the public and nursing home provider groups, studied the conditions in the nursing homes to determine why there were so many complaints filed against the facilities concerning resident care. Following the study, the legislature enacted Public Act 303, in 2002.

Michigan's Public Act 303 of Public Acts of 2002 (revised 12/15/03) was enacted to protect a vulnerable population. A person is defined as vulnerable when he or she is age 18 or over who, because of age developmental disability, mental illness, or physical disability requires supervision or personal care or lacks the personal social skills to live independently on his/her own.

This statute became effective on May 10, 2002 and required nursing homes, county medical care facilities, and homes for the aged to have a criminal background check on all employees hired after the above date. The new law allowed for three types of criminal background checks that are acceptable depending on the situation. These checks are (1) applicants who have already had a recent Michigan State Police (MSP) check. (2) Applicants who have resided in Michigan for over three years, and (3) those applicants who have not resided in the state for

three years.

In early 2005 the Office of the Attorney General conducted a study of the effectiveness or ineffectiveness of the statute. The total population of 40,490 certified nursing assistants was identified statewide. The total nurse aide population in the study area were 5,533, 14% of the states nurse aide population. The areas studied contained 50 nursing homes, approximately 12% of the states 472 nursing homes.

A complete criminal history was obtained for all nurse aides within the geographic area. The checks included convictions, outstanding warrants, confirmed protection orders, and the mental health incompetence/commitment orders. The study included the criminal history data only of nurse aide employees, if complete information was available.

The study revealed that certified nurse aides had a total of 1,218 outstanding warrants that if convicted of the offenses could preclude them from working in a nursing home. Excerpts of the study will be presented during the presentation, which will indicate that the present system of checking the backgrounds of certified nursing assistance is not acceptable.

Nursing Home, Abuse, Elder

D7 Intuition, Interaction, and the Team Approach to Death Scene Investigation

Mary Beth Hauptle, DDS, Fulton County Medical Examiner's Office, 430 Pryor Street, SW, Atlanta, GA 30312*

Attendees will learn the advantage of "thinking out loud" and trusting their instincts on the scene of death, in a team approach to resolving issues regarding the manner of death. This presentation will impact the forensic community by fostering the team approach to quality death scene investigation. Through review of a series of documented death scene investigations, the author will offer insight into the interplay of deductive thinking with intuition in making assessments regarding the circumstances of a death without witness. By offering lessons learned through experience, this presentation will teach the value of sharing information on the scene by naturally "thinking out loud." Typical questions investigators need to ask themselves about the imagined scenario of death will be posed.

The imagination will be given full rein in deciphering the activities of the decedent at the time of death, coupling known environmental facts with surmised behavior associated with poor judgment when ingesting alcohol. Scenes of death resulting from incumbent failure to execute safety precaution on the decedent's part will be presented.

The attendee will walk through an assessment of two distinctly separate yet similar death scenes and examine the thinking that went into drawing conclusions regarding the proposed manner of death. In comparing and critiquing the photographic documentation of the two cases, the author will demonstrate lessons learned in establishing a good vantage point of the photographs in "telling the story" and the impediment of artificial barriers to "seeing the forest for the trees." Challenges to elucidating the suggested unfolding of the circumstances of death to the medical examiner back in the office will be discussed.

The scene of an unwitnessed death involving decomposed remains will pique the curiosity of the attendee in mentally recreating the decedent's final actions by asking, "How and why did he wind up in that position?" When last known alive time was vague at best on an unwitnessed death scene investigation with mummified remains, an example of the rapid firing of the unconscious mind will answer the question, "What's wrong with this picture?"

D8 Case Controls: Law Enforcement's Best Kept Secret - Tools Used for Validating Information From Cold Cases

Alan Price, MA, Southern Institute of Forensic Science, Regional Field Service Office, PO Box 336433, Greeley, CO 80633*

After attending this presentation, attendees will be able to establish and maintain case controls under specific guidelines for solving major cold cases. This presentation will demonstrate how the principles of using case controls has been used by law enforcement, in an ad hoc method for many years, yet has gone formally undefined in the literature. This concept is passed from one detective to another without any formal guidelines being drafted and presented to standardize this important principle. This presentation provides both an explanation of describing case controls as well as outlining guidelines for the long-term management of case controls.

This presentation formally introduces the term "case controls"—sometimes referred to as "case keys" or "hold-back information"—into law enforcement and forensic literature, and provides guidelines for establishing and maintaining case controls as a means of validating information in cold cases. When a case has been inactive for months or years, it is imperative for investigators to be certain that a suspect or witness is admitting to the actual facts of a case. This is accomplished by the establishment of case controls early during the initial crime scene evaluation and review by investigators. Case controls should be discreet actions or behavior performed by the perpetrator (i.e., not newsworthy), yet these actions be obvious enough to be observed by a witness. The actions must be non-evidentiary in nature so that defense counsel cannot claim that law enforcement withheld pertinent information in the case. Although not readily available to on-scene investigators, evidence discovered through more technical forensic laboratory techniques can contribute to establishing case controls. For case controls to remain legally effective they must be kept from the media and other non-involved law enforcement personnel outside of the case investigation. The disclosure of case controls by an individual will immediately implicate the disclosing person of having first-hand knowledge of the crime and/or crime scene.

Law enforcement entities around the country use case control methodology in an *ad hoc* fashion, and although they have been used for years to validate information in homicides and other major crimes, the literature neither mentions the term, nor does it provide a specific definition of the principle. Case controls may be in place for years until either a suspect or a knowledgeable witness presents them. A means of evaluating and validating new case information is essential, particularly in long-term investigations where investigators may have been rotated to another assignment, retire, or leave their careers.

The suspect's signature:

The outdated study of the investigative process by the Rand Corporation is one of the most comprehensive studies of its type, yet it failed to address the use of case controls in solving major crimes. Current investigative text books also fail to mention the utility of case controls. It is imperative to demonstrate that case controls are not the *modus operandi* (MO) of the crime, and a sharp distinction should be made between the MO and the signature of a suspect. A perpetrator's signature left at a crime scene can be used as a very significant case control. John Douglas et al., define a suspect's signature as being, "a repetitive ritualistic behavior by the serial offender, usually displayed at every crime scene and having nothing to do with the perpetration of the crime." Obviously, if the actions of the perpetrator are specific to his crime these actions can become a means of verifying a suspect's admissions or a witness' observations. This presentation encourages the retention of any discreet actions or behavior performed by a perpetrator,

including signatures, as major case control.

Case Control Management:

The management of case controls is crucial to assure their use as a validation tool in solving a cold case. The following steps in managing these case controls are suggested:

1. The controls must be recorded in writing.
2. Controls should be placed in a sealed envelope and attached to the investigator's working copy of the case.
3. Access to the controls must be solely limited to the detectives that are responsible for investigating the case.

Case controls are never disclosed to the media. Divulging them eliminates their utility. The establishment of multiple case controls in each major case is recommended.

Elements used as case controls may include:

1. Specific actions of the perpetrator(s) that can be documented subsequent to the commission of the crime.
2. Instrumentalities used to commit the crime.
3. Specific elements in the immediate environment where the crime may have occurred.
4. Identified "souvenirs", "trophies," or "things of value" that may have been taken by the suspect.

It is suggested that investigators and crime scene technicians consult with their prosecutor's office to establish how the prosecuting authority wants the case controls to be maintained in criminal investigations. Since case controls are imperative in solving cold cases and validating information from suspects and witnesses, it is hoped that investigating agencies will draft and implement guidelines for their contribution in solving crimes.

Case Controls, Suspect's Signature, Modus Operandi

D9 Operation Iraqi Freedom's Social, Psychological, & Clinical Impact on Returning Soldiers

Kathleen A. Carson, MS, MBS, PO Box 20402, Billings, MT 59104*

After attending this presentation, attendees will have a better understanding of the personal impact and psychological impact of American soldiers serving in combat, the social impact of soldiers working with the extremely persecuted (Shiite children), the physical impact on soldier clinical forensic health issues incurred after two Persian Gulf Wars, and the forecasted future developments in Iraq's future.

We are all in one way or another parents, relatives, and fellow co-workers of soldiers currently or recently serving in the desert. This presentation will impact the forensic community and/or humanity by getting the word out to people who can make a difference for those who can no longer speak, Fallen Comrades.

Returning American soldiers become forensic suspect cases when they uncontrollably kill their spouse or act out rage and anger on others. Crime is filled with numerous accounts of prior soldiers killing from sadistic rapists to serial killers. Other soldiers will become clinical forensic cases like in the case of the Persian Gulf Illness.

The author presents this information as a soldier's case study in an effort to foster understanding and dedication to the men and women who have served and who shall serve honorably in the United States Armed Forces. Information gathered for this presentation was based on 8.5 months in Iraq as a Combat Service Support Acting Company Commander and Supply Platoon Leader in 2004 during Operation Iraqi Freedom II in southern Iraq and from serving as a Security Operations Assistant in King Khalid Military City, Saudi Arabia for three months during the first Persian Gulf War in 1991. It is recommended that those with forensic knowledge in areas of Criminalistics, Pathology, Psychology, Psychiatry, and Sociology assist in their appropriate field of research to help veterans readjust to society socially, psychologically, physically, mentally, and

clinically in an effort to prevent unnecessary violent crime.

War, Soldiers, Impact

D10 An International Survey of Forensic Sciences in the Investigation of Human Rights Violation Cases of Torture

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This poster will present a survey of international human rights violations cases of torture and the involvement of the forensic sciences. The presentation will emphasize the fact that torture exists today in over 120 countries including democratic countries and to promote a more proactive role of all the forensic sciences in cases of torture on an international scale.

Introduction: Defining torture is imperative in understanding the significance of forensic sciences involvement. Torture was defined by the United Nations in 1984 and this was the definition implemented for this study. Beyond understanding the definition of torture, it is pivotal to forensic investigations and the applicable forensic sciences to recognize the history of torture, the methods, and instruments of torture, the possible physical injuries sustained, in addition to the goals of torture, the target groups, and the potential perpetrators.

Method: Professionals who have direct involvement with victims of torture were surveyed to identify the nature and scope of the forensic science involvement in the investigation of past torture incidents. The participants were given a normative questionnaire requesting them to report on one individual incident. They were asked basic background questions about the victims and themselves including education attainment in the forensic sciences, the physical injuries the victims sustained, and several questions about the involvement of the forensic sciences. They were provided a list of the disciplines of forensic sciences including forensic investigation, forensic medicine/pathology, nursing, anthropology, radiology, odontology, psychology, toxicology, entomology, criminalistics, DNA analysis, firearm/tool mark analysis, trace evidence analysis, and document analysis. They were asked to indicate the involvement of these disciplines either to identify the victim, to obtain medical evidence, to determine time or cause of death, to gather evidence for a possible prosecution or for any other pertinent reason. They were also asked about physical evidence, documentation of that evidence as well as feedback on the judicial process of the case and professional opinion on the International Criminal Court and the importance of forensic science involvement in torture cases.

Results: There were 31 participants and 32 torture cases reported. The participants came from 15 different countries and from a variety of professions: 42% were from the psychology/ counselling field, 26% were from the medical field, 16% were human rights workers, 6% were lawyers and social workers, human rights investigators, and human rights educators were each 3%. They reported on torture victims from Afghanistan, Bolivia, Burundi, Cameroon, Chechnya, Chile, Ecuador, El Salvador, Georgia, Guinea, Guatemala, India, Iraq, Kenya, Nigeria, Pakistan, Rwanda, Sudan, Somalia, Uganda, Zimbabwe, and the United States between the years of 1973-2004.

In 66% of the torture cases, it was indicated that none of the disciplines of the forensic sciences were involved. In 11 of the 32, the following forensic sciences were indicated to be involved: forensic medicine/pathology, forensic nursing, forensic psychology, forensic radiology, forensic photography, DNA analysis, document analysis, and firearm/tool mark analysis. Forensic medicine/pathology was the most common forensic science being involved in nine of the eleven cases. It was also found that the forensic science involvement increased as the political power of the victim's target group increased.

Only 11 participants had formal education in one or more of the forensic sciences; therefore, a lack of knowledge in the forensic sciences

has been concluded from these findings. It was also found that educational attainment of the forensic sciences was actually higher in participants that were not from one of the main English speaking countries.

Of the 32 cases, ten indicated no judicial process, six indicated charges were laid, of which two went to a criminal trial, one was in front of the Human Rights Commission and expected to go to trial, five were pending a possible immigration trial, and nine cases were involved in immigration hearings in the United Kingdom, Canada or the United States. This study found that there was a slightly greater involvement of the nature and scope of forensic sciences in future criminal trials compared to immigration hearings for asylum mostly in the area of physical evidence.

Conclusions & Recommendations: Forensic science expertise is inadequately applied in the international investigations of human rights violations cases of torture. Therefore, this will require an increase in forensically trained professionals in all countries working with victims of torture to detect, collect, and preserve forensic evidence. Greater recognition and appreciation of the problem and the ability of forensic science to address this problem is needed. An expansion of programs like The Physicians for Human Rights- International Forensics Program and an international involvement in the International Criminal Court would be steps in the right direction.

Torture, Human Rights, International Criminal Court

D11 Cardiac Rupture Following Blunt Chest Trauma: The Case of a High Semi-Truck

Helene Yapo Etté, Department of Legal Medicine, Medical University of Toulouse (France), CHU Rangueil TSA 50039, Haute Garonne, Toulouse 31059, France; Celine Guilbeau-Frugier, MD, Stephane Grill, MD, Norbert Telmon, MD, and Daniel Rouge, MD, Department of Legal Medicine, Medical University of Toulouse, CHR Rangueil - TSA 50032, Haute Garonne, Toulouse 31059, France*

This author will demonstrate the mechanisms of cardiac rupture following a particular road traffic accident. This presentation will explain that cardiac rupture is the most common injury following road traffic accidents. This injury has a high mortality rate. Blunt cardiac ruptures most commonly follow road traffic accidents and have a high mortality rate.

This is the case of a truck driver who lost his life following a fatal accident involving his semi truck and a low viaduct. The driver failed to wear his seat belt and was travelling about 70km/h.

Cardiac Rupture, Road Traffic Accident, Autopsy

D12 Food/Foreign Body Asphyxia or "Café Coronary": An Often-Ignored Cause of Death

Arnaud N. Gaudin, MD, Henry-Bernard Petténati, MD, Nathalie S. Jousset, MD, Michel Penneau, MD, PhD, and Clotilde G.S. Rougé-Maillart, MD, Department of Forensic Medicine, 4 rue Larrey, Angers, 49033, Cedex 01, France*

After attending this presentation, attendees will be able to identify risk factors influencing food asphyxia especially in elderly individuals; and be able to suggest preventive as well as effective accident control strategies that can be used to minimize the risk of food asphyxiation among the elderly.

This presentation will impact the forensic community and/or humanity by providing knowledge that foods are a high-risk factor and should be distributed in private systems. Awareness could be a first step in reducing the incidence of food body asphyxia. It is the role of forensic

community to inform the public.

Introduction: Foreign body asphyxia is known to forensic pathologists, but many accidents are fatal because the event often goes unidentified. The authors analyzed six autopsy cases carried out recently at the forensic institute in Angers, France. The results were compared with available literature. The goal of this study was to identify risk factors.

Method 1st, 2nd and 3rd cases: Women aged 53, 41, and 42 with excessive body mass and living alone, are each found dead at home in the kitchen presenting signs of major asphyxia. The autopsy revealed suffocation from a 25g piece of non-chewed meat for one, a 7x2 cm lump of cheese for another and a ten cm piece of bun for the third. Two of the women had dental prostheses. Toxicological analyses show the presence of alcohol and therapeutic doses of tranquilizers in two cases. **4th case:** A 47-year-old man living alone and found dead in the kitchen slumped on the table. Suffocation was due to a 47g piece of non-chewed meat. The general dental status was poor and many teeth were missing. The patient had been treated with several anxiolytic tranquilizers. **5th and 6th cases:** Men ages 57 and 60, living with a friend, found dead, one in the kitchen and the other in the bedroom, after complaining of discomfort according to a third. The autopsy concluded suffocation due to a piece of meat in both cases. The dental status was poor. Analysis revealed high blood-alcohol levels and the presence of anxiolytics. **7th case:** A 62-year-old man experienced discomfort while eating in a restaurant. The autopsy revealed suffocation by a piece of meat. Toxicological analyses revealed a blood-alcohol level of over one gram.

Discussion: The subjects are of average age, while relevant literature describes these accidents at either extreme of life ages. Either the dental status was poor, or the subjects wore dental prostheses. This concept is confirmed by the literature: mastication, a *sine qua non* condition for correct deglutition, is a condition that requires good teeth. Alcohol is a recognized predisposing factor, as this study confirms. Similarly, the ingestion of barbiturates, either hypnotic or anti-epileptic, is often revealed (in six out of seven cases in this study). Authors also described the role of anti-dopaminergic or anti-cholinergic drugs. Finally, psychiatric pathologies are also considered risk factors. Four people underwent psychiatric treatment. This final element is perhaps linked to these people taking an increased-risk treatment. The foodstuffs found are often substances that are difficult to chew (meat, bread, cheese), that require more significant mastication efforts and good teeth. The accident often occurred at mealtime or afterwards. The study revealed only one case occurred before witnesses. In all other cases, the body was found in the kitchen.

Conclusion: In most cases, asphyxia is the cause, especially with more fragile subjects, who are suffering from psychiatric pathologies, chronic alcoholism and/or undergoing anxiolytic treatment. Emergency teams must bear this diagnosis in mind and attempt a Heimlich maneuver. Above all else, prevention must occur via improved oral and dental care for patients exposed to these pathologies, so as to reduce risks.

Food Asphyxiation, Autopsy Study, Cafe Coronary

D13 Sudden Cardiac Death In Young Adults

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Attendees will learn about the incidence of Sudden Cardiac Death in young adults, the contribution of social factors and behaviors to health

status, modification of these factors and behaviors, how to raise community awareness of sudden cardiac death, and inform them of available basic non-invasive cardiac diagnostic screening tests.

This presentation will impact the forensic community and/or humanity by identifying Sudden Cardiac Death as a major public health problem; along with other community agencies identify populations at risk.

Introduction: Sudden Cardiac Death (SCD) is annually the leading cause of natural death in the United States. It is unexpected and often the result of untreated rapid ventricular tachycardia or ventricular fibrillation. Sudden cardiac death syndrome may be due to a wide variety of different conditions, including but not limited to acute myocardial infarction, coronary artery disease, cardiomyopathies, myocarditis, valvular heart disease, conduction abnormalities and drug toxicity (prescription and recreational). Therefore, the Harris County Medical Examiner's Office has identified SCD as a public health problem of great significance. Identifying populations at risk for sudden cardiac death and implementing interventions that will decrease morbidity and mortality.

Purpose: The study was completed to identify those populations at risk for sudden cardiac death and to implement interventions with other agencies within the community.

Methods: A retrospective record review was conducted at the Medical Examiner's Office, identifying deaths reported from 2002 to 2004. Specifically natural deaths were reviewed in which cardiac death was listed as the primary cause of death after autopsy (external exams included). All ages were queried with special attention to those individuals under the age of 50. Social factors, such as obesity, tobacco use, and chronic ethanolism and their significance in this population were also reviewed.

Results: Persons who died of sudden cardiac death in 2002 comprised of 1,453 or approximately 52% of those individuals autopsied at the Medical Examiner's Office. Of those cases, 20% were under the age of 50, 72% were male and 51% were Caucasian. A notable 43% of the individuals were smokers. Obesity was listed on the death certificate as a contributing factor in 5% of the cases and chronic ethanolism contributed in 3%. Atherosclerotic Cardiovascular Disease and Hypertensive Cardiovascular Disease were diagnosed in 54% of those individuals under the age of 20 years. From 2002 to 2004, cardiovascular disease was shown to be the cause of death in 16 children between the ages of 12 and 18 with the majority collapsing while participating in athletic events.

Implications: The important contribution of social factors and behaviors to health status has been documented in the medical and public health literature. Modifications of these behaviors may greatly reduce the risk of SCD. The Medical Examiner's Office and other public health agencies have a vital role in raising community awareness of SCD. A key goal of public health education concerning SCD should be to inform the community of the benefits offered by basic non-invasive cardiac diagnostic screening tests, such as requiring electrocardiograms for young athletes in order to detect potentially fatal arrhythmias prior to participating in sports programs.

Sudden Cardiac Death, Social Factors and Behaviors, Young Adults

D14 Use of Portable Instruments for Locating and Sampling Suspected Arson Debris in the Field

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Attendees will learn about a method for location of possible

accelerants at a fire scene and collection of volatile compounds from debris in the field, eliminating the need to store large amounts of debris. This presentation will impact the forensic community by demonstrating a novel use of technologies that may be more efficient than current methods.

Arson is a serious crime resulting in hundreds of deaths and billions of dollars in property damage per year. Many fires are started by the use of an accelerant but the cause of an arson fire can be difficult to find. Electronic noses were evaluated in this study for their ability to detect the presence of accelerants in specific areas of a scene. After the location of possible accelerants has been detected by these devices, they may be collected using a dynamic headspace sampler to concentrate volatile compounds into an adsorbent filled tube. The instruments were studied for their abilities to detect various types of compounds. Diesel fuel, cigarette lighter fluid, charcoal lighter fluid, and gasoline were examined neat or spiked onto a matrix material and burned. The substances chosen cover the volatility range of common ignitable liquid residues in order to express any inefficiency in the collection range of the instruments.

These electronic noses are small battery operated instruments that give a reading of the amount of VOC's present in air. In this way, they can be used to scan a scene for areas of interest. Accelerant detecting canines can be used for the same purpose. These instruments, while possibly not as accurate as canines, can be inexpensive and do not require a highly skilled operator. Several types of instruments are available, but this study utilizes the TLV Sniffer® (Bacharach, Inc., Pittsburgh, PA). The TLV Sniffer® is not complex in design. A small pump pulls samples of air into the instrument. The change in temperature of a resistance element is measured and expressed on the meter in parts per million of hexane. Another commercially available detector, the tpi®Pocket Combustible Gas Leak Detector (Test Products International) has also been tested. This detector gives an audible alarm and four lights indicating the level of alert.

Different matrices were examined with and without accelerant using the TLV Sniffer®. Carpet and padding, wood, Styrofoam, plastic, newspaper, wood and laboratory tissues were studied burned alone or with accelerant. Carpet and padding, wood, newspaper, and cotton without accelerant showed similar levels burned alone as samples burned with accelerant. Therefore, high readings do not necessarily indicate the presence of accelerant. The type and amount of matrix must be considered in the analysis of debris. All of the matrix materials were mixed together to form a representative matrix of common household materials for further testing. The tpi®Pocket Combustible Gas Leak Detector has also been shown to alert to small amounts of accelerant but did alert in a few instances to burned debris alone. Interfering substances can cause difficulties with these types of instruments. However, when used as a preliminary indicator of where to sample, they have shown to be useful.

The Canine Accelerant Detection Association proficiency test for canines was replicated using the TLV Sniffer®. The detector was found to successfully discriminate between samples containing only matrix and those containing accelerants. However, it was not able to alert to the location of a small amount of accelerant spiked onto pine board.

For field collection of volatile compounds from debris the Portable Arson Sampler (Portable Arson Samplers, Tooele, UT) was used. The device uses dynamic headspace concentration to remove possible ignitable liquid residues from debris and store them in an adsorbent filled tube. A pump draws air from a heated debris chamber and the volatile compounds in the debris are absorbed to the polymer beads in a pre-packed glass tube. Use of this instrument in the field potentially eliminates the need to transport large volumes of debris to the laboratory. Compounds are removed from the adsorbent by solvent desorption and can then be analyzed using gas chromatography/mass spectrometry. The data analysis methods used are intended to help confirm or exclude the presence of an accelerant in a suspected arson sample despite possible interferences from background, pyrolysis, and combustion products. The spectra are examined for the characteristic patterns of known accelerants. By this method, the Portable Arson Sampler has shown its

ability to concentrate small amounts of accelerants from debris. The lowest volatility compounds were not efficiently collected under normal operating conditions, but enough of the characteristic pattern of the accelerant is recovered to allow identification.

Electronic Nose, Dynamic Headspace, Arson
D15 Intimate Partner Homicide in Lane
County, Oregon: Its Relationship to
Male Suicidal Ideation & Behavior

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After attending this presentation, medical examiners, death investigators, and public health officials will pay closer attention in their case work for the potential of male suicidal subjects to also have simultaneous homicidal ideation, particularly in relationship to violence toward intimate partners.

This presentation will impact the forensic community by increasing the consideration of the significance of risk toward homicide of male suicidal subjects. Implications for strategies of prevention, detection, and intervention in suicidal ideation in males will be discussed.

The rare incidence of intimate partner homicide is often amplified by intense public reaction coupled with scrutiny of public agencies by media reporting of such cases. Most scrutiny is retrospective upon how such an incident could have been prevented by intervention. The medical examiner has the opportunity of putting these deaths in perspective from their etiology in the entire context of public health and mental health issues in a community.

A recent such case in Lane County, Oregon involved an estranged husband who shot his wife at her residence as she returned from a court date at which he failed to appear. Responding police negotiated with him for several hours before he shot himself upon their entry to the residence. This case is resonant with a current case in the United States Supreme Court regarding the culpability of the law enforcement agency in failing to enforce an existing restraining order in a domestic dispute that resulted in a homicide-suicide of a father and his three minor children.

A survey of 75 homicide cases in Lane County over seven years demonstrated that women comprise 35% of homicide victims, and that about half of these women were killed by their intimate partners. Of these cases six also resulted in the suicide of their male assailants. The resulting question is posed: What percent of the far larger group of suicides occurred in the context of homicidal ideation toward an intimate partner?

This study reveals a significant number of suicides that occurred during or subsequent to violence directed at an intimate partner, short of homicide. One conclusion is that there is a great pool of males that frequently contemplate suicide as a mode of thinking and consequently engage in several modes of self-destructive behavior including domestic violence, suicide, and occasionally homicide. These cases usually occur without significant public awareness. This survey would suggest a relationship between the etiology of male suicidal ideation and the precipitation of domestic violence. Deeper study of this correlation may lead to strategies of intervention at the point of public contact between the perpetrator/victim and the medical-legal system.

Suicide, Domestic Violence, Intimate Partner Homicide

D16 The Variable Role of Kenyon Worldwide Emergency Services in the Mass Disaster Context

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Attendees will learn the variable role of the large scale mass disaster response organization, and highlight the role of interdisciplinary cooperation in this process. This presentation will impact the forensic community by making the forensic community aware of the variability that characterizes mass disasters, and the flexibility, in logistics, personnel, and protocol required to successfully adapt to this variation.

The efficient investigation of mass casualty incidents is dependant on the effective consultation of experts from a variety of disciplines that may include family assistance, crisis intervention, logistics, forensic investigation, forensic pathology, forensic anthropology, morgue technicians, and others. Every disaster is different and the coordinated adjustment of personnel in response to this variation can both expedite and increase the accuracy of the recovery, identification, and repatriation processes. This poster will use two recent disasters, the 2001 attacks on the World Trade Center in New York City, and the recent Indian Ocean Tsunami in Phuket, Thailand to illustrate the broad circumstantial variation that characterizes mass casualty situations; including discussions of variation in the scale of the events, logistical concerns, jurisdictional issues, and the issue of the taphonomic variation that distinguish the two events much of which is related to the distinction between man made and natural disasters.

Kenyon Worldwide Disaster Management is an international corporation whose mandate is to provide services in the wake of mass fatality incidents that include search and recovery of remains and personal effects, establishment and operation of mobile morgues, preparation, and preservation of remains both for repatriation and subsequent analysis, receipt and processing of personal effects, liaison and cooperation with law enforcement and emergency response agencies, and memorialization. Kenyon maintains a directory of experts of various specialties who can be deployed on short notice to fulfill roles in support of local agencies. The combination of those deployed is dependent on the circumstances of event and the needs of the client. In both New York and Thailand, Kenyon provided support in the form of logistics and personnel. This support was manifested in very different ways, however, as a result of the complex interaction of local resources and the specific circumstances of each disaster. For example, the city of New York maintained a contingency plan according to which the Office of the Chief Medical Examiner responded to the events of September 11th, 2001, and contracted Kenyon for additional support in the fulfillment of very specific goals in the investigation. The major role of Kenyon was as a provider of 1) expert personnel, including mortuary experts, and physical anthropologists, and 2) technology in the form of a technique by which the remains from the Trade Center were preserved for curing in a manner that is both economically feasible and effective for the preservation of potential DNA evidence. In addition, at the request of the Thai government, under the direction of the Australian government, Kenyon provided technical and administrative support in the Thai Tsunami Victim Identification Center. This information management center became the nerve center for all antemortem and postmortem record collection and reconciliation of records to determine positive identification of victims.

Specifically, this poster will include a written discussion of Kenyon's responses to these two incidents, and details regarding the complex cooperation between Kenyon and other agencies. The poster will begin by detailing the very specific differences between these two situations, including the fact that one was the result of deliberate human intent, and the other an act of nature. The taphonomic results of that distinction will also be discussed. Another distinction is the difference in the geographic scale of the two events and the associated jurisdictional implications. It will also include a graphical presentation (in the form of a tree diagram) of the structure that each deployment adopted as far as personnel, equipment, liaison activities, technical support etc.

This poster will benefit members of law enforcement, and management of emergency response agencies who are interested in developing contingency plans in the event of mass disasters. This benefit will come in the form of both sample data from which these plans can be developed as well as a demonstration of the extent to which the circumstances of a mass disaster can dictate the best response to it. It is also of a broader interest to the forensic scientist, particularly those interested in involvement in mass disaster investigation and response.

Mass Disaster, Disaster Response, Forensic Scientist

D17 Death and Diplomacy: Multinational Forensic Responses to Mass Fatality Incidents

Andrew J. Tyrrell, PhD, Derek C. Benedix, PhD, Kenneth N. Dunn, DDS, Paul D. Emanovsky, MS, Mark R. Gleisner, DDS, and Elias J. Kontanis, PhD, JPAC-Central Identification Laboratory, 310 Worcester Avenue, Hickam AFB, HI 96853*

Attendees will learn of the South Asian Tsunami disaster, a tragic event that brought to light some serious deficiencies in the realm of multinational forensic responses to mass fatality events. Some of these deficiencies as seen from the perspective of forensic scientists working at the mortuaries and information/data management centers in Thailand will be discussed. The reader will be made aware of some of the major process and coordination related issues still facing multinational forensic response teams.

This presentation will impact the forensic community and/or humanity by discussing major process and coordination related issues still facing multinational forensic response teams. It is anticipated that this poster will generate discussion among forensic professionals to help better prepare for the next mass fatality incident that involves decedents from different cultures and nations.

While the mission of the Joint POW/MIA Accounting Command (JPAC) is to search for, recover, and identify missing U.S. service personnel from past wars, JPAC is also tasked to undertake humanitarian missions. On 27 December 2004, JPAC was ordered to assist in the forensic response to the effects of the South Asian Tsunami. This poster presents some of the fundamental difficulties to overcome when large numbers of international Disaster Victim Identification (DVI) response teams work together. It illustrates these problems with reference to a case study where a body was lost at least three times, and an overview of the protocols utilized/enacted by the international community and local Thai authorities.

The current standard for the international DVI community (and that ultimately used post-Tsunami in Thailand) is the INTERPOL Protocol. Since, in its current incarnation, DVI is largely a police process; the INTERPOL Protocol reflects this bias. The protocols maintain an implicit assumption that scientific methods are the standards by which identifications are made. However, there is an explicit lack of scientific methodology that explains how to resolve the complex problems that arise when attempting to identify unknowns from large scale, open

ended populations.

As of 5 April 2005 over 174,000 individuals were presumed dead as a result of the 26 December 2004 South Asian Tsunami (CDC 2005). The confirmed dead in Thailand (CDC 2005) numbered 5,395. Approximately 50% of the dead in Thailand were non-Thai (CDC 2005). The Thai local authorities responded by collecting bodies and using local identification protocols and chain of custody procedures. They began storing bodies at temporary mortuaries and using a combination of the limited number of available refrigeration facilities, dry ice, and mass burials to try and decelerate the decomposition process. Initially four temporary morgues were established at converted temples (Wats). The Thai Royal Police has jurisdiction over the identification process in Thailand, but other Thai ministries are involved.

The Thai Government generously encouraged other nations to send forensic assistance. Approximately 30 countries sent DVI teams, or their equivalent, to Thailand, totaling over 600 personnel. A large multinational group (the Thai Tsunami Victim Identification Committee – TTVI) was eventually formed to oversee the identification process because of an urgent need to standardize operations, and thus the INTERPOL DVI protocols were implemented.

An estimated 700 bodies were “identified” and released prior to the establishment of the international DVI process. Since then, 4,082 postmortem and 2,164 ante-mortem data files have been created. From these data files, 1,112 bodies have been identified, including 1,046 identified on the basis of one type of data (962 dental, 71 fingerprints, ten physical, and only three DNA). Sixty-six others have been identified by combinations of data types.

More than 95% of identifications have been of persons aged >17 years. It is uncertain why there has been a failure to identify children successfully in Thailand, as children have been readily identifiable from previous mass fatalities (Sledzik and Kontanis 2005; Warren *et al.* 1999) and nearly 50% of the deceased were from first world nations where there is presumably wide availability of dental and other antemortem records.

This poster concludes by stressing the overwhelming need for an international coordination body with responsibility for DVI. This body’s first priority must be a critical review of the INTERPOL DVI system. Identification and repatriation is essential for the post-traumatic resolution of communities. Humanitarian assistance does not stop with the living.

South Asian Tsunami, Mass Fatality Incidents, Disaster Victim Identification

D18 The Swiss Approach of Assistance to Suicide

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Attendees will learn the legal and ethical aspects linked to assistance to suicide in Switzerland and compare them with those in other countries. This presentation will describe how, while it is quite unusual in most of European countries and in the USA, the practice of assisted to suicide is quite common in Switzerland.

Similar to euthanasia, assisted suicide is a subject that induces much discussion in many countries. While the law is very liberal in some countries such as Belgium and the Netherlands, this practice is very controversial in other countries such as France where it remains a forbidden subject.

In the United States of America, the laws concerning assisted suicide are very different from one state to another. For example, in Oregon assisted suicide is allowed if performed by a medical doctor. In other states, this act is condemnable. In Canada it is also punishable

according to their Criminal Code, section 41. In Switzerland euthanasia is condemnable by law. However, the penal code doesn’t condemn assisted suicide, whether it is by a medical doctor or another person, as long as it is not conducted by a selfish motive. The application of these practices has simplified in recent years and two societies for the right to die with dignity based on this principle born (Exit and Dignitas).

In the French and German speaking parts of Switzerland the association Exit assists individuals living in Switzerland with serious progressive and incurable disease, in ending their life. The association Dignitas, in the German speaking part of Switzerland, assists terminally ill individuals coming from foreign countries. Therefore, Dignitas every year assists several individuals from Germany where assisted suicide is not available at the present time.

Suicide Assistance, Euthanasia, Switzerland

D19 Crime Scene Reconstruction in Hospitals Using Wireless Technology

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The goal of this presentation is to illustrate two hypothetical crime scene preservations and reconstructions which were enabled by a hospital’s network of telemetry, global positioning systems, radio frequency identification tags and other technological applications. The resultant capabilities of such networks include the tracking and recording of personnel activities, monitoring of equipment location and performance, and the assurance of a secure, precise data trail for events within the clinical environment.

This presentation will demonstrate technology applications have great potential for enhancing and augmenting basic hospital security systems and tracking capabilities, thus serving as a deterrent to criminal activities within the care environment. The highly efficient network of various technologies creates an impressive information and communication trail; even the most ingenious will have difficulty in circumventing or defeating its multiple, interactive and redundant capabilities without leaving behind incriminating evidence in one or more of the permanent memory banks inherent in the system.

The use of wireless devices in hospitals has been stimulated by the need to improve caregiver efficiency, streamline workflow processes, prevent clinical errors, enhance patient safety, and ensure automated documentation of critical events and processes. It was soon appreciated that such systems could provide additional benefits for the facility, including loss prevention of equipment, medications, and supplies and the ability to reconstruct decision-making processes and actions of personnel for retrospective quality review. Furthermore, the budgetary constraints and nurse shortages compelled healthcare administrators to search for communication upgrades in their facilities that could be installed without major retrofitting or reconstruction and permit uninterrupted service delivery. The dynamics and complexities of today’s hospitals mandate a flexible, mobile, and easily upgradeable platform for its communication and information systems.

Telemetry and WiFi, wireless local area networks (WLANS), Bluetooth® technology, global positioning systems, and radiofrequency identification combine to create an incredible network for retrieving, analyzing, transmitting, and storing information about patient care activities and processes. The security processes inherent to wireless systems within healthcare possess the capabilities to track caregivers and equipment through the use of a passive RFID tag and possess multi-level

safeguards to prevent medical errors, ensure patient safety and precise recording of care-related events. “Plug and play” integration models orchestrate people, processes and technology, bringing together disparate equipment with the care arena. Sophisticated wireless networks can effectively serve as a platform for preserving and reconstructing crime scenes within healthcare settings.

The elements of a hospital’s wireless system will be outlined and the capabilities and interactions of components will be explained using clinical simulations. Two case presentations of hospital crime scene reconstructions will be used to illustrate the efficacy of data recovery from the hospital’s wireless platform which concretely links the suspect to the criminal behavior. Bar-coding, process flow in a radiofrequency identification system using passive tags, global positioning devices, equipment-imbedded software, and telemetric applications will be described as they relate to evidence preservation and crime scene reconstruction.

Wireless technology applications have great potential for enhancing and augmenting basic hospital security systems, thus serving as a deterrent to criminal activities within the care environment. The highly efficient network of various technologies creates an impressive information and communication trail; even the most ingenious will have difficulty in circumventing or defeating its multiple, interactive and redundant capabilities without leaving behind incriminating evidence in one or more of the permanent memory banks inherent in the system.

Crime Scene, Reconstruction, Wireless Technology

D20 Broken Windows: Evaluating the Reliability of a Crime Scene Reconstruction Technique

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Attendees can expect to learn about the reliability of the glass fracture examination technique used to determine from which side a window was broken. The attendee will also learn the history of this technique, and hear proposals for continuing research into the technique’s reliability.

This presentation will impact the forensic community by contributing the first reliability data measured under blind, controlled conditions for a forensic technique that has been in use for more than 70 years.

Austrian criminalist Hans Gross published in the 1890’s the first description of how a broken pane of glass may be analyzed to determine which side was struck by a penetrating bullet (Kendall 1934). In 1930, Ukrainian researcher S.N. Matwejeff expanded on the work of Gross and investigated glass fractures to determine from which side a window was broken by means of a fist, stick, or other object (Matwejeff 1931). According to Matwejeff, a pane of glass broken by a striking object often shows two types of fracture lines: 1) radial cracks, which originate at the point of impact and radiate outward in a starburst pattern, and 2) concentric cracks, which run from one radial crack to another, in a roughly circular pattern. The edge surfaces of these fractures often show distinctive curved lines, or arcs, running from one side of the glass pane to the other. At one end, each arc appears to intersect the face of the glass pane at an approximate right angle, while the other end of each arc will appear to intersect its respective face at a very oblique angle. The examiner determines if the fracture is radial or concentric, and then notes which face of the glass is intersected at a right angle by the arcs. Matwejeff’s technique states that for radial fractures, the right angle is

always on the reverse of the side of the pane that was struck. This has come to be known as the “3-R Rule” (Radial cracks have Right angles on the Reverse side of the force). Conversely, if the fracture being examined is a concentric fracture, then the right angle intersection will be on the same side as the face of the glass that was struck. Thus, if the examiner is able to determine which way the piece of glass was facing (such as by piecing together all the broken pieces to reconstruct the window, or by looking for dirt or paint on one side of the glass fragment, and comparing this to the glass remaining in the window) before the window was broken, the examiner can conclude whether the window was broken from the outside or from the inside.

Matwejeff’s published results reveal little about the conditions under which his test windows were broken. Furthermore, the Matwejeff study does not state whether the windows were examined under a blind condition, that is, whether the examiner had information beforehand about which side was struck. The absence of a blind condition raises concerns about examiner bias. A search of the literature revealed no published studies addressing the reliability of this technique. A FBI Bulletin of 1936 refers to experiments done by the Bureau in which over two hundred panes of glass were examined, and reportedly in each instance Matwejeff’s findings were confirmed (FBI 1936). However, this very brief description by the FBI reveals nothing about the conditions under which the research was done.

The present study sought to address two shortcomings of the existing research: lack of controlled conditions during experimental window breaks, and lack of a blind condition in evaluating the reliability of the technique. Ten identical wood-framed windows were constructed. Each was labeled with a number, and one side of each frame was marked A, and the other side was marked B. Each window was then randomly assigned to be broken by striking either side A or side B. Each window was mounted on an upright stand and broken using a measured amount of force, by means of a pendulum. All glass fragments from each window were collected and stored in labeled packaging, and each window frame was packaged without disturbing any fragments that remained within the frame.

Twenty-two volunteers were given a brief tutorial on the technique, and then they examined each broken window and its associated fragments in a blind condition. The volunteers were asked to determine from which side each window had been struck, and to record their responses on a form. Each volunteer also completed a questionnaire regarding his or her confidence in the accuracy of his or her examinations, and whether the volunteer had any prior experience with the technique (a volunteer reported previous training in the technique). The volunteers’ average performance was 8.1 correct evaluations ($s=2.18$, median=9.0), a result that is significantly higher than what would be expected due to mere chance ($p<0.001$). Of the 22 volunteers, nine evaluated all ten windows correctly. The probability of a volunteer getting all ten evaluations correct by chance alone equals 0.001. Of the 220 evaluations performed by the volunteers, 178 (80.9%) produced a correct response. There was a moderate correlation ($r=0.69$) between volunteers’ reported confidence in the accuracy of their evaluations and their performance.

These results suggest that the Matwejeff technique enabled the volunteers, on average, to determine the direction of force at a rate significantly better than chance. However, this is a preliminary study. Further research is warranted, and should include a control group of volunteers with no familiarity with the Matwejeff technique, in order to rule out the possibility that study volunteers gain information about the direction of impact from sources other than the fracture pattern.

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Glass Fracture, Error Rate, Daubert

D21 An Analysis of the Effect of Time and Distance Relationships on Case Solvability in Murder Investigations of Abducted Children

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This presentation will provide results from a study which will help police investigators more timely and efficiently identify strategies and implement tactics which will lead to the capture of child abduction killers and the solution of child abduction murder cases.

This presentation will impact the forensic community by improving the efficiency and effectiveness of the investigation processes of those murders. Time and distance have been examined as part of solvability research for murders in general; however, this study will examine the effect of time and distance relationships as solvability factors in murder investigations of abducted children.

Child abduction murders are incredibly difficult to solve and deeply impact society and law enforcement officials involved in the investigation. A considerable amount of scholarly material on murder exists; far less is available on the murder of abducted children. No researcher has addressed the influence of time and distance on case solvability in murder investigations of abducted children. The solvability factors which affect the clearance rates of these types of investigations have been largely disregarded by social scientists. Because the murder of an abducted child impacts society in such an overwhelming manner, the absence of literature in this area is disturbing.

The relationship of time and distance to solvability was explored by examining child abduction murders occurring from 1968 to 2002. Information from each case relating to time spans and intervals of distance between murder incident component pairs was analyzed to determine if the time and distance relationships are critical solvability factors in murder investigations of abducted children.

This study determined that while time and distance relationships contribute in some ways to case solvability for murders of abducted children, the effect of time and distance relationships on solvability is unique to child abduction murders. Results showed that when any information on the dates and locations of the four murder incident components was known, the probability of child abduction murder case solution increased. There is a strong positive correlation between knowing the dates of occurrences for the murder incident component locations and the ability to identify a perpetrator.

This research also showed that in child abduction murder cases, shorter time proximity between murder incident locations has no significant impact on case solvability. Previous solvability research has shown that the more investigators know about the distances between the pairs of the murder incident components, the more case solvability will increase; this study of murder investigations of abducted children showed similar findings. Relatively close time and distance proximity between murder incident component pairs did not contribute significantly to case solvability. In addition, when the time and distances proximity decreased among pairs of murder incident components, the relatively distant proximity in time and distance did not contribute to case solvability.

This study is a valuable investigative tool for use in murder

investigations of abducted children. Given the effect that intense media coverage of murder investigations involving abducted children and the intense pressure from victim's advocacy groups it is surprising that no empirical research has been undertaken before now to determine the effect of time and distance on case solvability in the murder of abducted children. This research adds to the understanding of investigation of murders of abducted children and provides several critical findings on case solvability in these types of cases. Because time and distance do not play the same role in case solvability in child abduction murder investigations as in general murder investigations, there may be other factors which can impact case solvability in murder of abducted children.

Child Abduction Murder, Solvability, Time and Distance

D22 What Criminal Investigators Believe are the Causes of False Confessions

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After attending this presentation, attendees will gain an appreciation of what criminal investigators believe are the causes of false confessions.

This presentation will impact the forensic community and/or humanity by demonstrating how false confessions have placed many innocent suspects in prison for lengthy incarcerations or executions. It is hoped that criminal investigators will take a more stringent view of what causes false confessions.

False confessions have become a mysterious phenomenon in recent years. Many innocent suspects have been exposed to the criminal interrogation only to provide their questioners with confessions to crimes they did not commit. Following these confessions, innocent defendants have been convicted and legally sanctioned for these reported crimes.

False confessions have been categorized as voluntary, coerced-compliant, and coerced-internalized. The voluntary false confession, the only one that is not influenced by law enforcement, is made by suspects who seek notoriety, suffer from mental illness, or attempt to protect the culpable party. The coerced-compliant false confession is a stressed-induced confession. Pressures exerted by interrogators may cause innocent suspects to succumb to accusations, and in an attempt to flee the intensity of the interrogation, confess to whatever the interrogator wishes. Their belief that a lack of evidence will prevent their convictions is often misled. The coerced-internalized false confession is received from suspects who experience mental breakdowns. Often consisting of confabulation, these confessions consist of fictional portrayals of what "could have" happened during the crime.

The forerunners of confession evidence are the criminal investigators who interrogate their suspects. In most interrogation courses, whether provided by police academies or commercial vendors, the criminal investigators are trained in various techniques and tactics that will assist them in inducing suspects to confess. Most criminal investigators are aware of the voluntary false confession, since high-profile investigations tend to draw these confessors to the public eye. However, the understanding and causation of the coerced-compliant and coerced-internalized false confessions is lacking.

A study was conducted of criminal investigators in St. Lawrence County, New York. The intention of the study was to determine what criminal investigators believed were the causes of false and truthful confessions. Interestingly enough, most respondents were able to define the various categories of false confessions. However, when questioned concerning their causation, the respondents were quite diverse in their beliefs. It was noted however, that the ones believed primarily responsible for the false confessions were the suspects and not the

investigators themselves. Other aspects of false confession causation addressed suspect suggestibility, the coercive environment, and confession reliability in court.

The majority of criminal investigators believed that the typical interrogation room was not coercive to the extent that it would contribute to the false confession. In terms of suspect suggestibility, it was believed that young, novice suspects were more prone to make false confessions. Alcohol was not believed to be a contributory factor for false confessions, but drug usage and substance withdrawal were. According to the respondents, all confessions, once admitted into court as evidence, could be deemed as reliable. This was placed solely upon the court's review of the confession's competency, and not the interrogation process. In this regard, false confessions have been admitted into court thereby causing sanctions against innocent defendants.

Voluntary, Coerced-Compliant, Coerced-Internalized

D23 Elder Injury at the End of Life

Patricia M. Speck, MSN, 1740 Overton Park, Memphis, TN 38112; and Diana Faugno, BSN, CPN, 1351 Heritage Court, Escondido, CA 92027*

Attendees will learn basic information about hospice care and non-intentional injuries and the healing patterns that occur with routine care in the frail elderly as demonstrated through a case study.

This presentation will impact the forensic community and/or humanity by providing better diagnostic skills of health care providers; assisting in the recognition that not all injury is intentional and that there are influences that can be revealed in the home setting; and providing care givers with stresses that will need local support services, such as Hospice programs.

The population of elderly is growing and will peak with the baby boomers in 2025. A significant number of these elders will remain in their homes with elder child caregivers. Some will have intentional injury and the research points to the issues with the caregiver. This case study however focuses on the frail senior elderly who are enrolled in hospice, expected to expire within six months, and are cared for by elder children. The hospice criteria for enrollment will be discussed as well as chronicled unintentional injury and the mechanism of injury. In this case study, the health care and ancillary care providers will be exposed to the unintentional injury potential in the frail elder, wound identification, information gathering assessment in a non-threatening, open environment, intervention that addresses the caregiver's needs, and safety support services necessary to maintain the comfort of the patient at the end of life.

Elder Abuse, Unintentional Injury, Intentional Injury

D24 Thailand Disaster-Tsunami 2004 (An International Response)

Frank A. Ciaccio, MPA, Kenyon International Emergency Services, Inc., 15180 Grand Point Drive, Houston, TX 77090*

The goal of this presentation is to review the events surrounding the tsunami of 2004 in Thailand with respect to how information was collected and processed in the International Information Management Center in order to determine positive identification.

This presentation will impact the forensic community and/or humanity by assisting the forensic science community in understanding the forensic and identification challenges faced in a natural disaster on an international scale. Although the methodology of how identifications are made has not changed, the advancement in technology has streamlined the process and the scope of developing, managing, and

operating an Information Management Center is as critical as managing and operating a temporary morgue.

On the morning of 26 December 2004, a series of large waves between 50-100 feet tall struck southern Asia following an earthquake in the middle of the Indian Ocean. One of the hardest hit areas was the southern peninsula of Thailand. The island of Phuket which caters to a large number of visitors from Australia and Europe saw the largest number of fatalities among foreign tourists. Over 5000 foreign tourists were killed as a result of the tsunami which brought together one of the largest international responses for victim recovery and identifications in recent times.

Forty-two countries lost citizens as a result of this tragedy. Therefore, the scope of recovering and identifying human remains was greater than any forensic professional could imagine. The response by international Disaster Victim Identification (DVI) teams, private companies, and foreign countries was more than anyone could expect. The incredibly high human cost was far beyond the expectation and expertise of the Thai authorities, who had never experienced a disaster of such magnitude and had not prepared a systematic management plan.

With any disaster, there are always challenges in the recovery, identification, and return of human remains back to families. Some of these encountered were the result of the remote location of the disaster, the lack of resources in the area, weather conditions, and cultural differences due to the involvement of so many different nationalities. However, the ultimate challenge was the ability to coordinate and process antemortem and postmortem records in order to determine positive identification.

Victim identification is critical in any mass fatality incident. During the tsunami disaster, a global Information Management Center (IMC) was created that became the nerve center and repository for both antemortem and postmortem records. Within the IMC, methods were developed to handle the large number of records and information that was being filtered into the system on a daily basis. During its peak operations, there were different DVI teams from 17 countries working in the IMC. In addition, personnel trained in reconciliation were called upon to provide their expertise using various identification software programs.

With recent advancements in computer, fingerprint, and DNA technology, investigators have the tools and techniques necessary to determine positive identification on more victims of mass fatality incidents. Though the days of comparing radiographs by hand still exist, modern technology has brought this process to another level. The scope of developing, managing and operating an Information Management Center is as critical as managing and operating the morgue in a mass disaster.

Mass Disaster, Mass Fatality Incident, Identification

D25 FEMORS – The State of Florida's Mass Fatality Response Team

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Attendees will learn how Florida developed a mass fatality response team to aid State Medical Examiners. This presentation will impact the forensic community by providing a working model to states interested in developing mass fatality response team.

Following the disasters of September 11, 2001, Florida's Department of Health Emergency Operations Division initiated steps to create a mass fatality response team as a state asset to serve local needs,

especially for non-federally declared disasters and to augment federal response resources. In concert with the University of Florida's William R. Maples Center for Forensic Medicine, the Department of Health secured grant funding from the Centers for Disease Control and Prevention's 1999 Bioterrorism Preparedness Grant for program development of the Florida Emergency Mortuary Operations Response System (FEMORS).

FEMORS mission is to assist and support the local District Medical Examiner's Office, Florida Department of Law Enforcement and other responding agencies, in the event of a mass fatality incident as directed by the Florida Department of Health.

FEMORS was inaugurated in July 2002 and initially tasked with establishing a web-site (www.FEMORS.org), recruiting forensic professional volunteers, and designing an initial training program which was conducted in March 2003. The scope of the program is designed to:

- Develop protocols and train teams of volunteer forensic professionals to assist Florida Medical Examiners during disasters.
- Develop a Mass Fatality Plan Annex to the State of Florida Comprehensive Emergency Management Plan, and
- Maintain a portable morgue for response to mass fatality disasters.

Protocols, annual training sessions including National Incident Management System, and the Mass Fatality Plan Annex were completed by the summer of 2005. Specialized training sessions for Odontology and Family Assistance Center operations have also been conducted. Procurement of portable morgue equipment (provided by a grant from the Office of Domestic Preparedness) began in the fall of 2005 to complete the program design.

Team members activated for disaster response become Department of Health temporary employees for compensation including coverage for worker's compensation and liability. FEMORS was placed on stand-by for the four hurricanes of 2004 and was deployed during Hurricanes Charley and Ivan to provide assistance. In 2005, FEMORS was placed on stand-by for Hurricane Dennis.

Funding Source: FEMORS is a sponsored activity of the University of Florida in collaboration with the William R. Maples Center for Forensic Medicine. FEMORS is supported by the Florida Department of Health with funding made available through the CDC Bioterrorism Grant Number U90/CCU417006.

Mass Fatality Response, Disaster, Medical Examiner

D26 Restructuring Data Collection Strategies and Investigation Priorities in the Resolution of Mass Fatality Incidents

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After attending this presentation the participant will have gained an awareness of the need for restructuring the organization of investigations into mass fatality incidents. By use of supporting data and guided questioning the authors demonstrate that the decedent identification process in particular is being led by poorly tailored postmortem data

collection standards. Participants will gain an understanding of the relevance of antemortem data standards. The authors will demonstrate that a balance needs to be redressed whereby antemortem data quality and availability become the guiding principles for determining the types of postmortem data collected and the standards of collection implemented.

This presentation demonstrate the overwhelming need for those forensic scientists involved in dealing with the aftermath of mass fatality incidents to start focusing on the "other half of the identification equation," i.e., antemortem data. The authors propose some structuring principles and guidelines that may be used to assist in more fully integrating antemortem data sets and to more successfully tailor postmortem data collection strategies to the antemortem data sets available for a given decedent population. This will lead to higher identification success rates, and, in the long run, a more timely repatriation of decedents.

The mass fatality incident (MFI) decedent identification process is driven by the collection and comparison of antemortem (AM) data and postmortem (PM) data to arrive at a positive identification. Current investigative efforts emphasize PM data collection methods and morgue operation procedures while paying relatively little attention to the relevance of AM data and congruence between the data sets. MFI investigations are currently driven by the PM data collection process.

The authors propose a new approach whereby PM data collection is driven by the availability and integrity of AM data. This approach requires that effective AM data collection procedures are tailored appropriately for the relevant populations and the underlying availability of data sources. Thus AM data appropriate to the incident must be made available prior to the onset of morgue operations, or simultaneous AM/PM data collection protocols must be rigorously constructed and implemented. To allow sufficient lead time the first priority of all mass fatality investigations is to stabilize the remains of decedents in order to minimize the loss of PM data. This stabilization period can be used to accommodate the development of effective and integrated AM and PM data collection and chain of custody procedures. Only once these are in place can PM data collection begin. The stabilization period is also a highly appropriate time to allow the resolution of national jurisdictional and international diplomatic issues.

To establish effective data collection protocols requires a fuller understanding of the variables that affect the identification process. Investigators must develop/address questions regarding four critical parameters:

- 1) Decedent population demographics
- 2) Incident dynamics
- 3) Capacity of available identification/investigation resources
- 4) Quality control of data collection

This information can then be used to construct hypotheses regarding the availability and applicability of AM information that will essentially guide the postmortem data collection process. Collection of PM data in advance of a full understanding of these four critical areas leads to wasted work and inappropriate (poor quality) underlying data that compromises the identification process. By delaying morgue operations until appropriately tailored data collection procedures are established the identification process effectively becomes a program of hypotheses testing utilizing high quality preliminary data. The authors will present data that identifies the primary variables affecting the MFI decedent identification process and how understanding these variables will expedite data collection and data synthesis.

The authors will also present case studies including the responses to a variety of aviation disasters, the 2004 South Asia Tsunami, and post-conflict human rights investigations in the Balkans. These will illustrate how the identification process and identification success rates following

a large scale MFI are affected by AM and PM data collection strategies. These case studies focus on irreconcilable AM and PM data collection strategies as well as the collection of congruent AM and PM data that is inappropriate given the four parameters identified above. The authors will conclude by proposing a series of questions designed to prompt investigators to recognize and classify the most appropriate AM and PM data for the decedent population they are intending to identify. It is hoped that these will facilitate the identification process. Restructuring investigative priorities and data collection strategies provides the best opportunities to maximize returns from the identification process to include the greatest degree of resolution for post-incident communities.

Mass Fatality Incident, Antemortem Data, Decedent Identification D27 Gunshot Injuries to Automobile Occupants: The Milwaukee Experience

John D. Carver, JD, MD, and Jeffrey M. Jentzen, MD, Milwaukee County Medical Examiner, 933 West Highland Avenue, Milwaukee, WI 53233*

After attending this presentation, attendees will be able to recognize characteristic patterns of gunshot injury, atypical entrance wounds, and confounding associated injuries often suffered by victims of gunshot wounds who were occupying automobiles. This presentation will alert the forensic community to these injuries, improve their interpretation and improve reconstruction of homicide scenarios involving automobile occupants, who often have left or been dumped from a vehicle, or been removed from a vehicle during resuscitation efforts.

This presentation will impact the forensic community by increasing the awareness and improving the interpretation of the wound patterns and confounding associated injuries suffered by gunshot victims who were occupants of automobiles.

A comparison of Milwaukee County homicides involving gunshot wounds to automobile occupants during 1994 and 2004 is made to determine whether there is an increasing incidence of these deaths. Of 156 deaths classified as homicides in 1994, 14% (n=22) involved gunshot wounds to automobile occupants. This percentage increased in 2004, when 18.6% of 97 deaths classified as homicide (n=18) involved automobile occupants. Selected cases from both years are presented to demonstrate characteristic patterns of injury in this setting.

Gunshot entrance wounds usually have a punched-out circular-to-oval appearance, with a surrounding area of abrasion caused when the bullet pierces the skin. Exit wounds are typically larger and more irregular than entrance wounds because the bullet loses rotational stability (“tumbles”) as it passes through dense tissue, and deforms as it hits structures such as bone. Entrance wounds can have an atypical appearance when a bullet loses stability before entering the body. This may be due to ricocheting, weapon/ammunition mismatch, poor weapon construction, or the presence of intermediate targets.

Automobile occupant victims frequently display atypical gunshot entrance wounds because intervening glass or frame material deflects and deforms the bullet before it enters the victim’s body. Atypical reentry wounds are the result of the bullet first passing through an upper extremity before reentry into the body. The perforation may have an irregular shape, with surrounding area of irregular abrasion. Tears surrounding the perforation may result in misinterpretation as an exit wound or, conceivably, as a contact entrance wound. Broken glass or other material from intermediate targets can also cause surrounding punctate abrasions and lacerations (so-called “pseudo-stippling”) that may be confused with actual powder stippling of an intermediate range wound. Passage of semi-jacketed bullets through intermediate targets can also result in separation of the jacket from a bullet, resulting in large, irregular entrance wounds or even separate entrance wounds.

In the case of multiple gunshot wounds, the individual bullet paths tend to demonstrate the same spatial trajectories through the body (i.e., multiple entrance wounds to the same side of the body with the same

front/back and up/down angles). If the victim is still able to move after the initial wounds, further entry wounds are sometimes found to the back, thighs, or buttocks. These would be the presenting targets to the shooter as the victim tries to escape further injury (by climbing over a seat or attempting to exit the opposite door). If initial x-rays of the body reveal a bullet not accounted for by the other entrance wounds and their corresponding bullet paths, careful examination of the buttocks and perianal area will sometimes reveal an additional well-hidden entrance wound.

Gunshot, Automobile Occupants, Homicide

D28 The Concept of the Forensic Landscape: Recognition of Patterns of Evidence in Mass Death Scenarios

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Attendees will learn the concept of forensic landscape—the recovery and recognition of evidence across an environment in space and time. This presentation will impact the forensic community by increasing recognition that surviving evidence of crime and the linking of apparently discrete forensic scenes are possible in many circumstances using multidisciplinary analysis.

It may be perceived that sites such as plane crashes or mass graves are distinct entities containing the dead from mass disaster or human rights violations. This is not the case. These sites are usually the most obvious, intact, complex and culturally potent manifestations of a wider evidence of large scale death events.

These “main” sites are but one part of the surviving evidence of criminal events that cover a given area in space and time. Related sites and evidence other than that found in these epicenters of investigative focus are numerous and widespread. They are not always systematically looked for. The Forensic Landscape can be described collectively as all sites, evidence, and patterns of forensic relevance within the environment.

The Forensic Landscape is the surviving topography, alterations, deposits, artifacts, and materials left in the natural and cultural landscape within a given time frame, concerning and related to specific criminal events. The forensic landscape may be the area of a specific site, or a continuous landscape, represented by a continuous spread of evidence across the terrain, or a series of spatially separate sites linked by the same process of criminal activity.

This paper will consider what concepts from archaeology and crime scene investigation can be employed to maximize the recognition and recovery of important evidence from such landscapes, and how loss of evidence can be minimized, using multidisciplinary approaches.

Forensic Archaeology, Crime Scene Investigation, Mass Death

D29 Digital Evidence Survey: Current Trends and Needs

Marcus K. Rogers, PhD, Purdue University, 401 North Grant Street, West Lafayette, IN 47907; and Kay Scarborough, PhD, Eastern Kentucky University, 425 Stratton Building, Richmond, KY 40475*

After attending this presentation, attendees will be briefed on the current state of Law Enforcement practices related to digital evidence and the gaps that currently exist in this maturing field.

This presentation will impact the forensic community and/or humanity by providing scientifically derived statistics on the amount and types of digital evidence being processed by state and local law

enforcement, and identify the needs that must be addressed.

The current presentation summarizes the findings from the 2005 Digital Evidence Survey conducted by Eastern Kentucky University, the University of Central Florida, and Purdue University. The study surveyed state and local law enforcement regarding digital evidence. The presentation will discuss trends related to the types and amount of digital evidence being collected and processed, and protocols and methodologies used during the phases of digital evidence handling and examination. The presentation will also highlight areas that were identified as requiring assistance, and provide meaningful statistics on the current state of digital evidence relative to state and local law enforcement.

Digital Evidence, Digital Forensics, Law Enforcement
D30 An Equivocal Death Investigation Case –
Multiple Stabbings: The Victim Self-
Inflicted 83 Stab Wound Injuries

Vernon J. Geberth, MS, MPS, PO Box 197, Garnerville, NY 10923*

The author will present an interesting equivocal death investigation, which involved multiple stabbing wounds, some of which penetrated the heart. The author will also reiterate the significance of the medicolegal findings in the police investigation and why it is essential that police and medical examiners work as a team.

This presentation will impact the forensic community showing the importance of the evaluation of victimology in determining the factors in an Equivocal Death Investigation as well as the importance of comparing autopsy findings with police investigation and the reconstruction of the crime scene. The impact of the presentation occurs when the audience understands that the medical evaluation of the multiple stabbing wounds explained how this victim was able to stab himself 83 times despite the penetrating stab wounds into the heart. The audience should appreciate the importance and significance of the medical examiner, the police, and prosecution working as a team to reveal the truth and see that justice is done for the deceased.

Equivocal death investigations are those inquiries that are open to interpretation. There may be two or more meanings and the case may present as homicide, suicide, or accidental death. The facts may be purposefully vague or misleading as in the case of the “Staged Crime Scene.”

In this case, a 61-year-old man was found stabbed to death in his residence by another male who lived in an adjoining apartment. The victim had been stabbed multiple times in the chest. The knife was found near the deceased’s left hand and a sheath for the knife was found near to the body. Lying on the floor next to the victim’s body was a half empty bottle of Drano® drain cleaner liquid. A door with a dead-bolt lock, which had not been secured, separated the premises. The victim’s body was lying in a water feature, which consisted of a tiled sunken basin with rock formation on the side. The water feature was devoid of water and had been plumbed shut at the end of her nose.

The police investigation indicated that the victim had been dependent. Detectives took a number of statements from people who knew the deceased. Most of the blood was confined to the basin and there were neither footprints in blood nor blood found anywhere else in the residence. There were numerous wounds to the abdomen area and some internal organs were protruding from the wounds. When the body was removed from the basin examination revealed slashing injuries to both wrists.

The medical examiner ruled the death a suicide. There were 83 stab wounds to the torso, multiple incised wounds to both wrists and ingestion of Liquid Drano®. The cause of death was exsanguination due

to multiple stab wounds of the torso. The wounds were largely concentrated on the left side. Four wounds penetrated the heart. One penetrated the full thickness of the right ventricle. In addition to the stabbing wounds into the torso there were also multiple incised wounds to wrist.

The police investigation coupled with the medical examiner’s findings determined this case to be a suicide involving multiple self-inflicted stab wounds, some of which penetrated the heart and the ingestion of Liquid Drano®, which caused hyperemia and hemorrhage.

The left ventricle of the heart supplies the pressure that you record in Blood Pressure measurement (120/80). The right ventricle of the heart is the collection

Equivocal Death Investigation, Suicide, Victimology

D31 Shooting Reconstruction: The Value of
Evidence & Analysis in a Double Homicide

Alexander Jason, BA, ANITE Group, PO Box 375, Pinole, CA 94564*

Attendees will learn about analytical methods used in the reconstruction of complex shooting incidents and in presenting information in trial. This presentation will demonstrate effective methods for producing a shooting incident reconstruction which can be utilized by others in the forensic community.

HYPOTHESIS: Complex and apparently unconnected physical evidence can be effectively utilized to support or refute conflicting versions of a shooting incident.

A double homicide occurred; two victims were shot to death. Two others present at the scene provided conflicting versions of the incident: In this case, there were 12 shots fired; the victims had multiple gunshot wounds with their bodies found in two different locations. Multiple bullet impacts, blood spatter on walls and objects, as well as many additional potential evidence items further complicated the crime scene. The primary issue: Was this a deliberate homicide or multiple acts of self-defense? The physical evidence, while substantial in quantity, was initially regarded to be of insignificant value in answering the key question.

This paper demonstrates the methodology involved in a multidisciplinary approach to the reconstruction and analysis of a shooting incident in which blood spatter, bullet impact damage, cartridge case locations, and victim wound path evidence from the autopsy, and other elements are all integrated into an analysis which can be used to determine significant facts. These facts can then be utilized to determine what could and could not have occurred and specifically, which version – if any — of the incident is consistent with the physical evidence. Although a shooting incident reconstruction always includes the forensic crime laboratory analysis of the physical evidence, an effective reconstruction requires an understanding of the capabilities and dynamic characteristics of firearms, projectiles, ejected cartridge cases, gunshot residue and the dynamics involved in the production and projection of blood spatter from gunshot wounds. A chemical test of physical evidence items provided confirmation of damage caused by bullets which contributed to the overall reconstruction and is an important tool in shooting reconstruction. This case is an excellent example of how all these items can be integrated into an analysis and reconstruction.

An additional important component in the overall reconstruction is the use of 3D computer animation modeling and the graphic enhancement of crime scene photographs. While both were used during the trial in the form of demonstrative exhibits, they were also used in the actual analysis and reconstruction. The detailed and scaled 3D computer model of the house in which the shootings occurred allowed the crime

scene to be rotated and viewed at many perspectives which was very helpful in determining both possible bullet trajectories and the trajectories of ejected cartridge cases. This paper will discuss the crime, the methods of the analysis, the reconstruction, and the trial outcome.

Shooting Reconstruction, 3D Computer animation, Crime Scene Analysis

D32 The Green River Murders

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Attendees will learn the motive, victim selection, methods of operation, body disposal techniques, and forensic evidence from the murders of the most prolific serial killer in American History, to date, Gary L. Ridgway. The presentation will consist of crime scene photos and video clips of Ridgway interviews.

This presentation will demonstrate the motive, victim selection, methods of operation, body disposal techniques, and forensic evidence from the murders of the most prolific serial killer in American History, to date, Gary L. Ridgway.

The 48 murders eventually connected to Gary L. Ridgway were part of the largest unsolved serial murder case in the United States. Ridgway was identified as a suspect in the Green River murders in 1984, but was not charged until a DNA test in 2001 linked Ridgway to four of the victims. Subsequently, forensic paint analysis was used to connect two of the victim's to Ridgway. Ridgway eventually pled guilty to 48 murders.

The presentation will focus on the modus operandi, victim selection and body disposal techniques Ridgway used in the first murders of the Green River Murder series. Video clips of Ridgway discussing the murders and a review of forensic evidence in the case will also be presented.

An overview of the Microtrace laboratory findings of tiny spheres of spray paint on the clothing of two of the Green River murder victims will be given. The spray paint formed small spheres which became embedded in the weave of fabric when dried while airborne. The particles, invisible to the naked eye, were easily transferable from killer to victim.

The paint samples were connected to Ridgway because they were identical to a highly specialized DuPont Imron paint used at the Kenworth truck plant which employed Gary L. Ridgway. In March 2003, Microtrace laboratory connected the spheres from the jeans which formed the ligature around victim Wendy Coffield's neck to the spheres found at the Kenworth truck plant. Microtrace was also able to identify the paint spheres on the clothing found with Debra Este's body. Again, the spheres were determined to be identical to the highly specialized paint used only at Kenworth truck plants and which happened to be in use at the factory in which Ridgway worked. Fortunately, because Ridgway was a carrier of the particles, five of the victims were connected to Ridgway through forensic paint analysis. Ridgway pled guilty to 48 counts of aggravated first-degree murder; including six that police had not initially connected to the case.

Green River Murders, Gary L. Ridgway, Serial Killer

D33 Forensic Science Continuing Education in the Classroom

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The goal of this presentation is to discuss the content and experience of providing longstanding continuing education to the adult public in forensic science and serve as a starting point concerning forensic science education in adult classrooms in their jurisdictions.

There is current widespread educational interest in forensic science as evidenced by numerous listings that contain "forensic" in their titles of academic offerings found by an Internet search. Continuing adult education courses offered by the School of Continuing Studies at the University of Toronto (www.learn.utoronto.ca) remain unique in the field of forensic science education.

Traditional university degree programs in forensic science provide a formal basis for the full-time student to seek experience and employment in forensic science. Continuing education is also available in specialized courses for the forensic practitioner at professional society meetings or other locations with a specific topic within the field. Education is also available through some criminology or criminal justice programs where an instructor with an interest in forensic science imparts information to the student geared toward employment within the criminal justice system. A few "on-line" courses are also available to the public. Continuing education classroom-based courses in forensic science at the School in Toronto are available to the public. Students of these courses may be involved in the aforementioned educational areas, or alternatively, be spawned to become involved in them or other areas such as law or law-enforcement. The courses are also attended by lawyers and law enforcement officers to enhance their knowledge of forensic science.

The School in Toronto has annually provided courses in forensic science to adults in the public domain since 1981. The core course, entitled "Forensic Scientists at Work," consists of nine two-hour evening classroom presentations and concludes with a final evening tour of a forensic laboratory with a multidisciplinary panel discussion with students. The course begins with an introductory presentation about forensic science and the judiciary, followed by forensic aspects of scene/exhibit identification, biology, chemistry, document examinations, coroner investigations and inquests, pathology, toxicology, and major case investigations. The last area incorporates several aspects of forensic science that were utilized by police in an actual investigation that was fully processed by the courts. Nine instructors, each a specialist by academic training and professional experience in their respective areas of forensic expertise, are engaged in the course, and include four active forensic scientists with government and/or consultant practices, two qualified medical practitioners, and three law enforcement officers. The Course Coordinator instructs the first class and another in their area of forensic expertise. The Coordinator also provides additional presentations on supplementary and/or timely topics, as well as engages questions in the classroom with the other instructors and students.

In 1998, the School in Toronto began to provide additional courses on an annual basis entitled "Special Topics in Forensic Science." It currently offers a series of three additional courses with two-hour evening presentations that provide other topics over a three-year cycle. Scientists have presented on forensic aspects of anthropology, entomology, geology, climatology, firearms and toolmarks, blood splatter interpretation, hair and fibers, fires, explosives, digital evidence (computers), gaming machines, engineering, quality assurance, drug analyses and clandestine preparation sites, alcohol in forensic casework, drug facilitated sexual assault, poisoning, and workplace drug testing. Medical/health practitioners have presented on forensic aspects of psychiatry, psychology, dentistry and odontology, sleep and fatigue in human performance, memory, and nursing. Law-enforcement officers and other specialized investigators have presented upon forensic aspects of criminal profiling, sexual assault, fraud, arson, motor vehicle collision reconstruction, video animation, and independent public investigations of police officers. Other presentations have included forensic social work and legal aspects of expert witness

testimony, the latter involving a prosecutor and defense attorney.

Forensic practitioners engaged in teaching the public can hone their presentation and critical thinking skills by being involved in an academic interactive group format with students which may further their effectiveness in testifying to a jury at a trial. Students learn from instructors and other students in a classroom setting, and are provided by the instructors/Coordinator with supplementary resources for further information on topics of interest.

The strengths of the format at the School in Toronto include presentations from many actual forensic practitioners in their field of expertise, an interactive classroom format of delivery, an in-class Course Coordinator for technical/administrative support and additional presentations as required, and a tour of a forensic laboratory followed by a multidisciplinary panel discussion

Public, Continuing, Education

D34 Northeast Regional DNA Academy Performance Metrics

W. Mark Dale, MBA, and Donald Orokos, PhD, University at Albany, Northeast Regional Forensic Institute, 1400 Washington Avenue, Albany, NY 12222*

After attending this presentation, attendees will be able to design a curriculum to include performance metrics that address the quality and productivity of forensic science DNA analyses. This presentation will demonstrate the key to quality in forensic science is education. Continuous courseware from academic institutions with competency assessments is needed for new scientist training and continuing education for experienced scientists.

This presentation will describe the curriculum and performance metrics of the NERFI DNA academy. Conceived as a regional center of excellence, the NERFI addresses a critical and ongoing need to produce highly trained, case-ready technical personnel for careers in professional forensic laboratories. NERFI will foster collaborations between local, state, and federal criminal justice agencies and other academic institutions to develop forensic programs in education, research, and outreach. The DNA Academy program was designed to provide a solution to address the nationwide shortage of forensic scientists. The explosive growth of DNA technology in the field of forensic science has created critical casework backlogs in all public and private forensic laboratories. Traditionally, the overwhelming majority of forensic laboratories have been forced to use one – on – one mentor training for new and existing employees. Laboratory efficiency is decreased by Mentor training and competition for casework instruments by 50%. The goal of the DNA Academy is to shorten the conventional one - on - one mentor training programs from one year to six months with a dedicated state of the art forensic training facility, university approved curriculum, staffed with SUNY Albany faculty and nationally renowned visiting scientists. Students successfully completing the DNA Academy will earn 12 credit hours of graduate course work. More importantly, the newly trained scientists will also meet all mandated state or international accreditation standards for forensic laboratories.

The curriculum from the Graduate program in Forensic Molecular Biology has provided the courseware framework for the DNA Academy. The University at Albany was one of the first in the Northeast to deliver a 40 credit Graduate Program in Forensic Molecular Biology. Overall, this program has been very successful. Thirty-five students are now enrolled in the program. The program is now in its fourth year and graduates have proceeded to placement in many private laboratories, public laboratories, and Ph.D. programs.

The DNA Academy curriculum consists of four modules that deliver 12 graduate credits hours of academic course work. Module 1 is a one credit hour, 8-week long distance learning component that provides the latest theories of forensic DNA technologies. A digital library of all pertinent reference materials and interactive video

conferencing will be used for the distance-learning module. Module two and three consist of eight weeks of laboratory instruction held at the University at Albany. The “Mirror Laboratory” concept will employ the latest technologies currently in use in all forensic laboratories. The students will analyze evidentiary samples that are identical to the items received at crime scenes and submitted to forensic laboratories. For example, bloodstains on all types of substrates will be recognized, collected, amplified, and analyzed by identical instruments and techniques used in forensic laboratories. Moot court will then be used to measure the competency of all students as per national accreditation guidelines. The program is concluded with Module 4, a one credit hour, 4-week distance-learning component that instructs students in advanced techniques and report writing. Individual segments of the program will also be used to provide professional development programs that are mandated by legislative accreditation criteria. The graduates of the program will be competent to analyze a variety of evidentiary items routinely submitted for DNA analyses when they return to their home laboratories.

The authors will present performance metrics (number of extractions, quantifications, amplifications, and profiles generated) from a variety of samples analyzed by the students at the NERFI DNA Academy. Follow up surveys of the students will evaluate and compare mentor training to NERFI DNA Academy programs.

Forensic Education, Performance Metrics, DNA

D35 The Challenge of Teaching Bugs, Botany and Blood (DNA) in One Course

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Attendees will learn one approach to teaching quite dissimilar forensic topics to undergraduates in one course. It is presented to create dialogue with others teaching similar courses and hopefully create constructive criticisms on this course and other similar courses to increase the courses effectiveness. This presentation will provide one example on how to teach diverse biological topics in one course. It is presented to create dialogue with others teaching similar courses and hopefully create constructive criticisms on this and other similar courses.

This presentation outlines one of the four forensic courses taught in the Ferris State University (FSU) forensic undergraduate programs. The forensic biology degree builds on a major’s foundation of biology and chemistry, with unique core courses in forensic biology, forensic chemistry, forensic human pathology, forensic DNA analysis and criminal justice courses in evidence and law. The degree is designed for the student who is interested in analyzing biological evidence as it relates to legal and other investigations, or collecting and processing evidence at a crime scene or in a laboratory.

Two of the courses taught in the forensic biology curriculum are also available for students in the Criminal Justice Forensic Minor Program and other curriculums such as psychology majors and allied health majors etc. The forensic biology course in this curriculum is the application of biological knowledge and laboratory and field techniques to criminal and civil investigations. Students in this course receive extensive training in the collection and analysis of biological evidence in both lab and field settings. Students learn how to evaluate mock crime scenes that include decomposition of animal remains in the field. They also learn how to document, collect, and analyze the insects, plants and other biological evidence to determine the time of death. Students learn to identify skeletal remains, and evaluate postmortem trauma by

scavengers.

The problem in teaching this course is obvious. Students of mixed biological and chemistry backgrounds require the course be taught to give a delicate balance between background information and substance. Enough background to help the under prepared in biology and chemistry and enough substance to prepare the forensic biology majors and non majors alike to understand the meaning and importance of the biological evidence at the mock crime scenes.

The course has evolved over the seven years it has been taught to currently include three distinct areas of concentration, forensic botany, forensic entomology, and introduction to forensic DNA analysis. The course is lab oriented with lectures supporting the labs with background information. The laboratory periods for the botany and entomology are spent outside collecting the information at mock crime scenes and inside evaluating the information, writing reports, and predicting time of death. Five crime scene investigator teams collect the evidence with specific tasks at the mock crime scene. The students are grouped by dissimilar backgrounds by the instructor and the groups are shuffled for each lab period. This allows all students to be involved in all types of data collection. The groups enter their data on the computer and that data is available on the course web page. Students are required to turn in the mock crime reports every week. The DNA labs are conducted inside and are hands on labs.

This presentation is one example on how to teach such diverse topics in one course. It is presented to create dialogue with others teaching similar courses and hopefully create constructive criticisms on this and other similar courses. This course also does not claim to teach students enough information for them to become expert witness in any of the topics but to open their eyes to the possibility of the value of this data to an investigation.

Teaching, Botany, Entomology

D36 Implementing an Accreditation Program in Forensic Science Education

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Attendees will be exposed to forensic science education in Egypt and have information about the state of education that has an important role in solving medicolegal problems using scientific processes.

The department of Forensic Medicine and Toxicology of the Faculty of Medicine, University of Alexandria was established in 1942 to promote education for and research in the field of forensic sciences. Since 1980, efforts have been made to improve the quality of education and training for both undergraduate and postgraduate students. Today, modifications are being applied to meet specific curricular requirements because most forensic scientists work in areas such as drug analysis, trace analysis, firearms, tool marks, and forensic biology.

Acknowledging the importance of an accreditation system for academic programs, the department started to implement new measures in forensic science education and student assessment to meet the requirements imposed by the American Academy of Forensic Sciences for accreditation. This will require evaluation and monitoring the overall efforts to fulfill the department mission, goals and objectives. It will also entail evaluation of students' performance, gathering information from graduates, collection of job placement statistics and employers' survey. The department will use the results of these evaluation activities to modify the curriculum and to improve the quality of education to meet the accreditation requirements.

Accreditation, Curricular Requirements, Education

D37 Consensual Flogging is not Physical Abuse

Diana K. Faugno, BSN, 1351 Heritage Court, Escondido, CA 92027*

After attending this presentation, attendees will understand that not all lesions on patients that present to your practice are indicative of physical abuse. History is important in order to determine if the injuries are due to physical abuse, accidents, or ritualistic erotic practice.

This presentation will impact the forensic community by expanding the knowledge base that not all bruises are the result of physical abuse. The practitioner needs to obtain the history of the lesions and educate the patient regarding unsafe practice in both flogging and strangulation.

The attendee will be able to review photographs of consensual flogging on the buttocks of a young girl. Her birthday present was a whipping by a group of young adults who used cat of nine tails to whip her over her clothes. She also disclosed that she practices consensual strangulation with her partner. She describes that her partner will let go when she is passing out. She imitates both of these practices before she has sex.

The history is crucial to determine the facts, especially what parts of the event were consensual. In some cases, attorneys must decide if the case has enough evidence to support a crime. It is difficult when the flogging and strangulation practice starts out consensually but has elements of force and ends in death. The key point is also patient education that consensual flogging and strangulation does not fit the credo of safe behavior. The intervention you provide may help the patient avoid morbidity or mortality.

Consent, Physical Abuse, Ritualistic Erotic Practice

D38 Extra-Genital Injuries in Sexual Assault

Amy Carney, MS, MFS, Palomar Pomerado Hospital District, 16226 B Avenida Venusto, San Diego, CA 92128*

After attending this presentation, attendees will recognize injuries which occur during sexual assault in other than genital areas of the body and understand the prevalence of these injuries in the absence of genital findings. Documentation on the State of California Form OCJP 923 will be illustrated, and photo documentation of injuries will be presented.

This presentation will emphasize the need for evaluation and documentation of all injuries during the forensic examination in sexual assault in addition to genital findings, and enhance the quality of forensic evaluation and medical care of the sexual assault victim.

Sexual assault is any form of nonconsensual sexual activity, ranging from fondling to penetration, and occurs across all ethnic classifications as well as age span, gender, and social class. Extra-genital injuries (EGI) are those which occur during sexual assault on other than genital areas. These include hematomas, abrasions, lacerations, erythema, and swelling. Mechanisms of injury include strangulation, stabbing, human bites, and blunt force trauma. During the course of a sexual assault injuries may occur on multiple sites and in multiple forms.

A review was done of 88 victims of sexual assault who were examined by the Palomar Pomerado Sexual Assault Team (SART) in 2001. The data was obtained from the County of San Diego SART Protocol. This study describes the rates, patterns, and characteristics of injuries across the represented ethnic groups. The injuries were documented by type, location, and mechanism of injury when available.

Each case was reviewed for indication of sexual assault and all associated injuries, and then evaluated by distribution and number of injuries. The hypothesis for this study was “In data collected from an ethnically diverse urban and suburban population incidence of extra-genital injury will be found to be evenly distributed across the represented ethnic groups, regardless of presence of genital injuries.” Injuries were primarily identified in two groups: 1) Classified, as defined by type and location, such as “perianal skin abrasion”; and 2) unclassified, such as “swelling.” In 53 of the cases the victims knew their attacker, 13 were in a relationship with the assailant, 18 were strangers, and four were “unknown or other.” The total number of EGI across all groups was 239. Incidence of EGI was found to be evenly distributed in three of the four examined groups. The findings of the study indicate that EGI were present in all 88 cases and in each group, even though only 75 cases had findings consistent with sexual assault.

Sexual Assault, Injuries, Extra-Genital

D39 SANE Program Evaluation Questionnaire (SPEQ©) Pilot in Three Cities

Patricia M. Speck, MSN, 1740 Overton Park, Memphis, TN 38112*

Attendees will learn about the development process of the SPEQ© and its applicability to new and developing SANE programs nationwide. This presentation will demonstrate multi-faceted research, which includes: 1) the fact that, since their inception, SANE programs lack continuity in their evaluative processes; 2) the use of the SPEQ© will highlight successes and opportunities to improve SANE programs in a number of content areas; and 3) SANE program evaluation is based in scientific method to meet the needs of the users of SANE programs, such as prosecutors, law enforcement, and forensic nurses.

The recent development of Sexual Assault Nurse Examiner programs nationally has provided an opportunity for justice for victims of sexual crimes and the accused. Their development has been identified as an emerging practice to help meet the goals to reduce violence against women and supported by an evolutionary understanding that is rooted in public health’s understanding that violence is a health issue (Koop, 1985). These organizations include the World Health Organization (1984), the Department of Justice (DOJ) Office on Victims of Crime (1985), and the DOJ Office on Violence against Women (1994).

These international and national efforts to reduce sexual violence have had success with falling sexual crime rates, but there is no research to identify *what* in these programs is working to help in the falling rates of victimization. Since all programs that affect the public’s health have been identified by the CDC to be either government-based, not-for-profit, or commercial enterprises, it is logical to use the *Framework for Program Evaluation in Public Health* (CDC, 1999) recommendations as a model to study SANE programs. This model includes engaging stakeholders, describing the program needs and resources, activities and expected effects, and providing an objective evaluative design.

The collection of scientific data, interpretation of the data and collaborative feedback with dissemination of the results is the hallmark of effective program evaluation (CDC, 1999). The SANE model of care does not have a unique tool with which to evaluate the program’s formative development and activities or substantive outcomes. In 1999, the OVC funded a study about the development of SANE programs and their operations. The author (Ledray, 1999) lamented that there were “no hard data” to support the SANE model.

This researcher has developed and validated a tool for the evaluation of SANE programs. This presentation will present the pilot study of the three programs.

SANE Program Evaluation, SPEQ©, Program Evaluation

D40 Validation of Commercially Available

Field Test Kits for Drugs of Abuse

Joan G. Ring, MS, Kathleen A. Savage, PhD*, and Kirk Grates, NFSTC, 7881 114th Avenue North, Largo, FL 33773; and Michael Healy, Manatee County Sheriff’s Office, 515 11th Street, West, Bradenton, FL 34205*

This presentation will provide attendees with information regarding validation of commercially available field test kits for drugs of abuse which will allow them to make purchases that suit their purposes.

The National Forensic Science Technology Center (NFSTC), has developed a comprehensive training program and quality assurance system that provides law enforcement with the resources necessary to perform preliminary identification of controlled substances utilizing field test kits. In order to provide information concerning test kit performance, this program has been expanded to include a validation study of the test kits most frequently employed by law enforcement. The test kits included in the validation study are those manufactured by ODV, NIK, and NARK II. In particular, the kits designed for presumptive identification of marijuana, cocaine salt, cocaine base, methamphetamine, and heroin were assessed. Sensitivity, specificity, and reproducibility were the criteria evaluated. Neat drug standards, neat cutting agents, samples of known percentages of drug standards mixed with common cutting agents, and street samples were tested. Each sample was run in duplicate with color assignment after a one minute time interval. Colors were represented by a numeric designation of hue, value, and chroma from the Munsell Color Chart System.

The results of this validation study provide law enforcement agencies with data to enable them to select test kits best suited to their needs. Information is provided with respect to the measured criteria as well as corollary observations regarding test kit quality control, handling safety, and color. Results and conclusions of this study will be presented here and included in the Best Practices Guide provided by NFSTC to all interested parties.

Validation, Drugs of Abuse, Field Test Kits

D41 Cocaine Related Deaths in Tarrant County

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Participants will learn about the distribution of cocaine related deaths as related to the age, gender, race, and socioeconomic status according to the zip codes in various parts of Tarrant County.

The Tarrant County Medical Examiner’s Office serves a population of over two million Americans and over 8,000 inquests in 2004. A large number of deaths are associated with drug abuse and among them cocaine is most frequently used.

In pre-Columbian times the coca leaf, which is the source of cocaine, was officially reserved for Inca Royalty. The natives used coca for mystical, social, religious, nutritional, and medicinal purposes. In the following years, cocaine was effectively used as a pain killer, as well as a surface anesthetic. In later years, for the pharmaceutical firm Parke-Davis, cocaine was a fast selling product for hay fever and catarrh remedy. In 1886, Coca-Cola was sold as a temperance drink and was very popular and invigorating. Until 1903, a typical serving contained approximately 60 milligrams of cocaine. Today the Coca-Cola Company uses only the coca leaves for flavoring since the drug has been removed.

Cocaine is a powerfully addictive drug. During 2002, there were an estimated 1,059,000 new cocaine users in the United States. The average age of those who first used cocaine during 2002 was 20.3 years. According to the 2003 National Survey on Drug Use and Health, approximately 34.9 million Americans age 12 and older had tried

cocaine at least once in their lifetimes. This represents 14.7 percent of the population ages 12 and older. About 5.9 million (2.5%) have used cocaine in the past year and 2.3 million (1%) had used cocaine in the past month.

Among the students surveyed in 2004, 3.4 percent of eighth graders, 5.4 percent of tenth graders, and 8.1 percent of twelfth graders reported using cocaine at least once during their lifetimes. Regardless of the ease by which one can obtain cocaine, 19.4 percent of eighth graders, 31.2 percent of tenth graders, and 41.7 percent of twelfth graders reported in 2004 that cocaine was fairly easy to obtain.

The purpose of this study is to establish the role of cocaine use in Tarrant County. The Tarrant County Medical Examiner's cases between the years 2000 and 2004 are tabulated to the following manners of death: natural, accidental, suicide, and homicide. Between the years 2000 and 2004, out of all cases reported to have mixed drug abuse, 376 cases were found to have cocaine.

Yearly Distributions of Cocaine

Year	Male	Female	Black	Hispanic	White	Other
2000	22	11	13	2	18	0
	0-19	20-39	40-69	70+		
	0	22	11	0		
2001	32	10	11	4	27	0
	0-19	20-39	40-69	70+		
	2	20	20	0		
2002	32	6	8	5	24	1
	0-19	20-39	40-69	70+		
	2	19	17	0		
2003	65	16	25	10	45	1
	0-19	20-39	40-69	70+		
	6	34	41	0		
2004	127	55	22	29	130	1
	0-19	20-39	40-69	70+		
	25	61	83	13		
2000-2004	278	98	79	50	244	3
	0-19	20-39	40-69	70+		
	35	156	172	13		

Cocaine, Socio-Economic Status, Zip Code

D42 Program Design for the DNA-STR Genotypes Searching System on Criminal Scene Application

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Attendees will learn how to manipulate valuable casework data with databases and design other evidence to collect. This information

will be compiled from routine cases by using the DNA-STR genotypes Searching System. The authors offer the DNA-STR Searching Genotypes System which provides high efficiency, friendly operational procedures, absolute security, and convenience. The authors hope to integrate the resources of forensic science in Taiwan and keep feasible connection with worldwide related databases via Internet.

In the past several decades, short tandem repeat (STR) markers have become a tactful strategy for forensic DNA typing including individual information in forensic caseworks and paternity tests. However, the DNA databases are built of STR loci based on CODIS 13 and Y chromosome STR loci in forensic laboratories. These databases are eagerly shared with other forensic labs in Taiwan, aiming to establish local forensic data network for rapid identification of suspects, victims of catastrophe, and nameless human remains. In order to easily and feasibly manipulate these valuable databases, the authors developed a new automatic computer program, which is capable of integrating the current STR loci databases with pending data, meanwhile, searching and storing what is desired. The rapid, fuzzy and automatic computer program, so called the DNA-STR genotypes Searching System, is originally based on the platform of the Borland company software written for analyzing the present commercially available multiplex STR kits (from Applied Biosystems and Promega company). The commercial product of Borland company, Delphi Professional software, is a complete rapid application development (RAD) environment for the visual design, compilation, and debugging of programs written in the Delphi and C languages. Programs can be targeted for Win32 and Microsoft .NET. The Professional edition also provides RAD database development with basic local database connectivity.

Albeit the self-developed DNA Search System is designed on the basis of Delphi Professional software, there are various novelties coming from it. On the one hand the designed program can be applied to search local databases at each client site of local personal computer with authority control at the server end and on the other hand it can be connected and shared with other international DNA databases via web net. There are five icons available to key in individual data and various searching demands for comparison with either single case or multiple cases (group) to the whole database. The efficiency of the program has been tested by operating ten unidentified data to seven thousands individuals STR loci database and it was estimated in less than three minutes to finish. The authors are also planning to amplify the functions of the program by combing the ability of automatically calculating the index of the Power of Discrimination/Exclusion, Probability of the match, and the other statistic applications with this searching system for forensic cases and paternity tests. The excellent characteristics of the program are high efficiency, friendly operational procedures, absolute security, and convenience.

Short Tandem Repeat (STR), DNA Database, Computer Program

D43 CPI Distribution and Cut-Off Value for Duo Paternity Building

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Attendees will learn that CPI can be very low for real duo paternity cases and CPI could be very high for random pairs (duo). The presentation will demonstrate that a suitable CPI range should be developed for determining paternity.

The STR loci comprising CODIS has an average power of paternity

exclusion larger than 0.9999 based upon mother, child and father combinations (a trio case). This figure is true for many populations. In cases requiring the identification of human remains if only one living relative (either of the parents or of offspring) is available, this represents a duo case for parentage building. In duo cases when allele sharing is found in all the 13 loci, the probability of parentage could be determined. However, it is hard to avoid a false parentage evaluation if the pair happened to share an allele at all 13 loci. In Taiwan, the National Unidentified Bodies CODIS 13 STR Database has approximately 1250 bodies and 350 families for comparison originally. Using STR typing and blood-relative comparing instances a body first-degree matched to more than one individual was rarely found, however the CPI (Cumulated Paternity Index) was extremely low. It is necessary to evaluate the false parentage rate and set a cut-off value of CPI and vice versa to analyze the distribution of CPIs from real paternity cases, hope to help evaluate the paternity and lead to identification.

According to the published frequencies of STR alleles, the cumulated power of exclusion (PE) for duo for Chinese in Taiwan is 98.13%. The data showed that about 1.87 % random individuals could not be excluded from being a first-degree blood relative to the population. For proving this, CODIS 13 population data of 1,000 Chinese in Taiwan was collected and paired resulting in 499,500 pairs. Microsoft Excel Macros controlled by a Visual Basic program written by authors was used to handle the allele sharing comparison and CPI calculation. There were 462 (0.0925%) pairs found with all 13 allele sharing loci. False parentage relation was noted when the CPI for pairs ranged from 2.56 to 6,835,432.78, and the median CPI was 484.69 meaning that if the CPI of 484.69 were used as the cut-off, 50% of the false pairs would not be recognized as first-blood-relative, and if the CPI cut-off increased to 1,000, 62.9% false pairs could be eliminated, however the false exclusion rate for real duos was 5.7%(cut-off = 484.69) and then increased to 10.8%(cut-off = 1,000) respectively. The dilemma could be resolved by profiling more STR systems when duos were found with low CPI or adding anthropology and other information to make the confirmation. This is especially the case for mass and open comparing operation of STR database for the unidentified bodies.

Forensic Science, STR, Paternity

D44 Fluvial Transport of Bones: Our State of Knowledge and Future Research Directions

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The author will offer a review of the forensic, anthropological, and paleontological research related to bone transport and deposition in river systems. A synopsis of the consistent results between the studies reviewed will be presented as well as a discussion of the conflicting data and ideas. Directions for future research will be outlined.

This presentation will provide a concise statement of what is known about bone transport and deposition, which should aid investigators in making informed decisions about where to look for the rest of a partial skeleton in a fluvial context, and make more informed reconstructions of the postmortem history of the remains under investigation. In some jurisdictions finding human skeletal remains in fluvial systems is relatively common. However, in a search it is often hard to find more than a few parts of a skeleton, and often reconstruction of the skeleton's history is complicated. This review will not enable investigators to identify exactly where to find bones or to identify exactly what their histories have been, however it will give them more information to work with that may increase their productivity and success rates with such cases.

Understanding the postmortem history of the bones found in forensics, anthropology, or paleontology requires knowledge and understanding of the processes that act on a body and its parts after death. Many modern and fossil remains are found in rivers or in

association with river sediments, often having been transported by the river in order to be deposited where they are found. In order to piece together the postmortem history of remains found in fluvial contexts it is essential to understand how bones are transported in and deposited by river systems.

Previous work on the subject has focused on three methods of inquiry: 1) settling column experiments, 2) flume experiments, and 3) observation of bones in rivers. Settling column experiments generate data that can be used to calculate a theoretical behavior of bones in river systems; however, this theory has not yet been tested rigorously. Flume experiments have been used to directly observe bone transport and deposition while subject to water flow. Results of these experiments contradict some of the predicted behavior calculated from settling column studies. Flume data is powerful, however, in order to run flume experiments many flow and sediment conditions are held constant; a situation rarely found in nature. As a result, the conclusions made from flume data on bones have an unknown applicability to natural systems. Few studies have been performed placing bones in rivers and observing their behavior. Those experiments have shown that a bone's shape, size, and initial orientation alter its transport properties within a river. Similarly the interaction between the river bed and the bone being transported significantly alters a bone's transport and deposition potential.

From the above studies it is known that a bone's shape, size, density, and orientation in a flow all alter its transport potential. A bone's shape, size, and orientation can be loosely combined into one variable; the hydraulic shape. The hydraulic shape and density of bones seem to be the controlling factors in the transport of bone material. As flow velocities and water depths change the hydraulic shape, density, and the velocity profile of a river interact to produce deposition or transport of bones. General rules for the interaction between hydraulic shape, flow depth, and flow velocity will be advanced and discussed.

Future research should include a test of the existing bone transport theory generated from settling column experiments. Many bones should be characterized in a settling column, their transport behavior predicted, and this prediction should be tested by placing bones in a river system and observing how they are transported and deposited. Actualistic data obtained from bones in rivers should be compared to flume data to ascertain how applicable flume data is to the real world. Bone weathering and abrasion during transport should also be studied since modifications to bone surfaces could yield useful information about transport distance, and potentially the postmortem interval.

Fluvial, Transport, Bones

D45 The Many Facets of the Forensic Nurse in Mass Disaster Response

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Attendees will learn how forensic nurses offer a diverse background to integrate knowledge and clinical skills in all aspects of care when faced with natural or man made disasters. This presentation demonstrate the diverse applications that forensic nurses offer to multidisciplinary agencies when faced with a mass casualty event

Effective response to disasters is a necessary action of disaster teams in effort to secure and support the nation. Understanding scene safety and security is essential prior to rendering care to the injured. Forensic nurses, as members of disaster teams, are prepared to respond to situations from natural disasters to man-made disasters. Stabilization of injured persons is foremost in the acute phase and when standards of care and nursing practice directly apply to rendering treatment to injured victims.

There are countless types of disasters. Examples include: fires, building collapses, weather emergencies such as ice storms, hurricanes, or drought, pestilence such as West Nile Virus, and mass transportation incidents. Combinations of natural and man-made disasters occur and clinical forensic nurses are prepared to take on their role in an efficient and effective manner.

Administering first aid and emergency treatment is foremost and key at any mass casualty scene. Clinical forensic nurses are valuable assets in the stabilization and evacuation time period because they provide rapid immediate assessment of the injured and advanced life support care. They routinely deliver acute emergency care in trauma, contributing to the triage process and treatment of disaster victims. Some instances may require them to accompany the victim to a medical treatment facility to continue established care and life saving support.

Gathering critical information such as the victim's medical history, an account of what has occurred, and telephone numbers of family members may assist in facilitating care and treatment to each individual. The nurse's ability to accurately assess and meticulously document observations of sustained wounds and to interpret mechanisms of injury acquired by victims proves advantageous in the pathological examination of injuries and in forensic investigations that may lead to civil or criminal litigation. Emergency response to and recognition of the forensic implications of these events is critical and overwhelming. The forensic nurse is a natural liaison to any community challenged with multidisciplinary efforts.

Because forensic nurse's cross-train with multiple agencies in preparation for mass disasters, the role of the forensic nurse is clearly understood as is their mutual understanding of the professional disciplines within the disaster response team. Forensic nurses may have opportunities to work with search and rescue teams, law enforcement agencies, and American Red Cross volunteers. Knowing what community services exist, directing people to the proper resources may assist in family reunification, and finding systems of support.

Provision of mortuary care, facilitated by the medical examiner's office, is another aspect of nursing care that forensic nurses are resourceful in facilitating communication between families and mortuary services. Identification of human remains as well as addressing concerns for care and disposition of bodies are duties of forensic nurse's that serve as death investigators.

Forensic nursing care continues into the aftermath of a disaster as delayed presentations of physical and/or psychological symptoms may develop among survivors. Nurses must consider that not only primary disaster victims but also caregivers and first responders to traumatic events may suffer from long term physical or mental health symptoms. Forensic nurses provide follow up care and referrals for such victims.

Lastly, a focus on prevention of future disastrous events must be considered to promote health and safety during all incidents. A review of outcomes following events and evaluation of what was learned is imperative in future planning and prevention. Forensic nurses understand the health care response to trauma and violence and contribute to expertise in health care. Training and education offered through the Department of Homeland Security, as well as governmental and community agency resources, is suggested.

Forensic Nurse, Mass Casualty Event, Disasters

D46 Strangulation in Sexual Assault

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After attending this presentation, attendees will be able to identify the different mechanisms of strangulation and have an understanding of the issue of power and control in sexual assault as well as the need for

complete history documentation in the absence of physical findings. This presentation will impact the forensic community by raising the awareness of the need for meticulous examination and documentation of the sexual assault victim who has been strangled.

Strangulation as a mechanism of assault is often poorly understood by both investigators and victims in a trauma situation. The victim may be unable to completely describe what form the assault took, and investigators are often reluctant to pursue a mechanism in the absence of physical findings. The terms "strangulation" and "choking" have been used interchangeably in the literature which leads to confusion when attempting to differentiate the symptoms the victim is describing and the manner of assault.

Strangulation is frequently used as a means of control in sexual assault. The neck is a very vulnerable area in an attack, as the diameter is fairly small and the airway is fairly unprotected. The only weapon usually necessary is one the attacker has with him: hands. Although a ligature or other tool can also be used, the hand and forearm are the most commonly found to be used in strangulation. Symptoms described by victims after an attack include breathing and swallowing changes, voice changes such as hoarseness, a perceived feeling of swelling in the outer neck or internal structures, restlessness or combativeness, and incontinence of urine or stool. If physical injuries are present they may include bruising of the neck, scratches or abrasions, redness in the eyes from subconjunctival hemorrhage or discrete petechiae, and ligature marks if one was used. However, many victims have no visible injuries and some are too minor to photograph. Physiologic theories on how injuries produce symptoms include venous obstruction leading to cerebral stagnation and hypoxia; vagal collapse caused by carotid pressure as well as arterial spasm due to carotid pressure. The location on the neck in which the attacker applies force, how much force, and for how much time, as well as the surface area to which it is applied are all variables involved in producing symptoms. The amount of time that has passed between incident and injury documentation, be it very quickly or moderately long, can make the difference on finding "visible" injuries.

The authors will present two case studies of strangulation in sexual assault showing minimal visible injury to the neck with resultant symptoms. The need to ask the victim about injury to the neck will be emphasized as many forensic examiners fail to ask, examine, or document and most victims do not volunteer this information unless questioned.

Strangulation, Sexual Assault, Injury

D47 A Classification System and Identification Key for .177 Caliber Pellets

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After attending this presentation, the participant will understand: 1) the variety of .117 caliber air gun pellets styles available; 2) the procedure for classifying .117 caliber air gun pellets based on class characteristics; and 3) the advantages and disadvantages of identifying .117 caliber pellets based on class characteristics.

This presentation will demonstrate the development of a classification system that can be incorporated into the forensic laboratory to aid in the investigation and identification of pellet brands.

The purpose of this presentation is to present the results of a .117 caliber pellet classification system for identifying different brands of pellets based on their class characteristics.

In some cases, a pellet recovered from the crime scene may assist investigators by identifying the product brand. Even though all product brands cannot be identified, various brands of pellets can be eliminated based on the pellet's class characteristics.

An examination of 68 pellets from fifteen companies was conducted to determine if the brand of an unidentified pellet could be identified based on the pellet's class characteristics. The pellet producers were from China, Czech Republic, England, Korea, Spain, and the United States.

The five class characteristics used in the pellet classification system were the pellet's head shape, skirt type, length, weight and other markings or observations. The last characteristic was used to distinguish pellets with similar head style, skirt type, length and weight measurements.

The first division in the pellet classification was pellet head shape. These included: domed or round, wadcutter, pointed, and hollow point. Of the 68 pellets examined, 24 (35%) were domed or round; 21 (31%) were wadcutter; 17 (25%) were pointed; and six (9%) were hollow points.

The second division in the pellet classification was based on the skirt type. Pellet skirts were either plain or ribbed. Of the pointed pellets, 14 (82%) were plain and three (18%) ribbed. The domed pellets were 16 (66%) plain and eight (33%) ribbed; the wadcutters were 20 (95%) plain and one (5%) ribbed. None of the hollow pointed pellets was ribbed.

The third division was based on the pellet's length. Ten pellets from each of the 68 types were measured with dial calipers to determine the average length of each pellet type. Pellets were grouped according to similar lengths but placed in separated categories when the length dimension exceeded .010 inches. The length for all pellets ranged from .199 to .392 inches.

The fourth category used to separate the pellets was weight. Ten pellets from each of the 68 types were weighed with a digital scale to determine the average weight for each pellet type. The weight for all pellets ranged from 7.0 to 18.2 grains.

The last category used to separate the pellets was other observations. These observations included whether the pellet had a visible seam on the side of the pellet. Pellets may be a non-diabolo style. They may have rings around the head or be manufactured out of plastic or metals other than lead. Also, they may have a coating.

Symbols used in the classification system for pellet head type were "P" for pointed, "D" for domed, "W" for wadcutter, and "H" for hollow point. Symbols for pellet skirt type were "P" for plain and "R" for ribbed. The length of the pellet was recorded in thousandths of an inch and the weight was recorded in grains. Markings and observations were noted in parenthesis. The class characteristics were separated by dashes in the classification system. For example P - P - .298 - 11.5 - (3-ring head) indicates a pointed pellet with a plain skirt that is .298 inches in length, weighs 11.5 grains and has three rings on its head. An identification key was made using the symbols so that when a recovered pellet is classified it may be checked against the 68 known types. This is not an absolute pellet identification system; however, it provides possible product identification of some pellets for the investigator. The system can also eliminate numerous pellet brands.

After classification, the domed pellets were subdivided into four groups. Group I contained seven pellet types; group II, five pellet types; group III, four pellet types; and group IV, eight pellet types. The wadcutter pellets were subdivided into five groups. Group I had seven pellet types; group II, ten pellet types; group III, two pellet types; group IV, one pellet type; and group V, one pellet type. The pointed pellets were subdivided into four groups. Group I contained four pellet types; group II, seven pellet types; group III, three pellet types; and group IV, three pellet types. The hollow point pellets were subdivided into four groups. Group I contained three pellet types; group II, one pellet type; group III, one pellet type; and group IV, one pellet type.

In conclusion, after subdividing the pellets, the largest category was the wadcutter type. This subdivision contained ten (17%) of the pellets. Even though individual pellets could not be identified in this wadcutter group 58 (83%) of the other pellet types could be eliminated. The

smallest category was the hollow point pellets. This subdivision contained seven (10%) of the pellets. Of the 68 pellets examined 12 (18%) had unique class characteristics that permitted individual identification based on visual comparison with known pellets. Of the pellets with unique class characteristics, three were domed, three wadcutter, five pointed and one was a hollow pointed pellet. The pellet classification system and identification key would assist investigators in the identification of some pellet brands and the elimination others.

Air gun, Pellet, Class Characteristics

D48 Child Abduction Murders: A Description of the Victims, Offenders, and Factors Affecting Investigations

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Attendees will learn the results of a study that will provide police investigators with descriptive information which will lead to the capture of child abduction killers and enhance the solution of child abduction murder cases. This presentation will impact the forensic community by improving the efficiency and effectiveness of the investigation processes of child murders. Very little information exists in social science literature about the victims, offenders, victim-offender relationships and other factors affecting murder investigations of abducted children.

Child abduction murders are incredibly difficult to solve and deeply impact society and law enforcement officials involved in the investigation. A considerable amount of scholarly material on murder exists; far less is available on the murder of abducted children. This study provides an overview of descriptive information about the victims, offenders and other factors affecting the investigations of child abduction murders. The characteristics of the victims as well as the characteristics, motives and actions of offenders were examined. A description of the victim-offender relationship, the offender's motivation, and victim selection process is also included. Variables relating to the victim's cause of death and offender's post-offense behavior will be presented. Finally, a descriptive analysis of the variables affecting case investigations, physical evidence, and a comparison of single-victim and series cases in this sample are also included. Because the murder of an abducted child impacts society in such an overwhelming manner, the absence of literature in this area is disturbing.

The child abduction murder dataset (CAM) included 833 child abduction murders. Only cases in which the victim was 17-years-old or younger were used for this analysis ($N = 735$). Offenders in this sample ($n = 589$) were not identified in all child abduction murder investigations included in the CAM dataset.

The typical child abduction murder victim in this sample was a white (74.5%) female (74.0%), approximately 11-years-old ($M = 11.52$). Victims in this sample were predominantly from a middle-class (35.2%) or "blue-collar" (35.8%) family, living in an urban (29.3%) or suburban (35.2%) neighborhood, in a single-family residence (71.1%). The victim's relationship with their family was good (49.8%) and the family situation was not generally considered high risk (83.5%).

The typical offender from this sample of child abduction murder

cases was a white male, approximately 27-years-old. The data indicated some interesting and meaningful characteristics of child abduction murderers which may enable law enforcement professionals to quickly identify and guard against potential offenders.

It is critical to understand the victim-offender relationship in order to properly protect children. The data indicated interesting differences in the victim-offender relationship by age and gender. The data also indicated that children are at a higher risk of victimization from those that they know than strangers.

In addition to information, on victims and offenders and their relationship, variables relating to the actual investigation process were explored which may prove valuable to detectives. A descriptive analysis of the variables affecting abducted child murder investigations including those related to witnesses, canvasses, and searches, investigative steps in the first 48 hours and physical evidence is provided.

Child Abduction Murder, Victim-Offender Relationships, Factors Affecting Investigation

D49 Forensic Radiography: Response to the London Suicide Bombings on 7th July 2005

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After attending this presentation, attendees will understand the role of radiography in the investigation of mass fatality incidents, the range of imaging technologies available and their application to the identification of the deceased and the forensic investigation of terrorist incidents. This presentation will present a case study of the application of radiography in the investigation of mass disasters. It is recommended that all mass fatality plans provide for rapid mobilization of radiological services using fluoroscopy and digital imaging.

Methods: On 7 July 2005, 56 people were killed and over 700 injured when suicide bombers staged four simultaneous attacks upon the London Transport system.

Positive identification of human remains is one of the most important tasks in mass disaster investigations and the London Mass Fatality Plan was immediately put into operation. A fully equipped emergency mortuary was established on a Military site in the City of London and was operational within 48 hours after the attacks. In accordance with the plan, the Association of Forensic Radiographers initiated its national response, mobilizing 27 forensic radiographers from throughout the United Kingdom who worked 12 hours per day in teams of 4-8 equipped with two digital fluoroscopes, direct digital and computed radiography systems and dental radiography equipment.

Radiological examinations followed the same established principles of the management of trauma, with primary, secondary, and tertiary surveys being undertaken at different stages of the investigation, making use of the most appropriate modern technologies available.

Over a sixteen day period, 56 bodies and 1162 body parts were examined. Primary surveys of whole bodies in unopened body-bags were undertaken using fluoroscopy by teams of two radiographers and a pathologist. The aim of the primary survey was to establish the nature of the contents of the bag, identify any hazardous material that may present a danger to mortuary workers, note any distinguishing features that may aid in establishing the identity of the victim, record the

presence of jewelry and personal effects, note obvious injuries and, as the event was known to be a result of terrorist action, to search for any clues such as weapons or bomb fragments that might lead to a better understanding of the attack. Hard copy image was provided by means of a thermal film printer.

In the case of body parts, the primary survey was undertaken using direct digital and computed radiography. This technology offers a wide dynamic range, affording the pathologist, anthropologist, and crime investigator the facility to review the images under a variety of display settings to determine bone detail, soft tissue detail, and the presence of both metallic and non-metallic objects from the same examination.

Secondary surveys were undertaken following removal of clothing and external examination by the pathologist. The purpose of the survey was to document anatomical features that may be used for identification by undertaking radiographic examinations using standard projections for comparison purposes. In this particular incident, the secondary surveys were mainly limited to intra-oral dental radiography in conjunction with the odontological examination.

Tertiary examinations of both bodies and body parts were undertaken at the request of the pathologist in a number of cases.

Results: Fluoroscopy facilitated rapid location of jewelry and personal effects and allowed for documentation of injuries sustained by the victims. A number of foreign bodies were noted at primary survey and those that proved difficult to locate at postmortem examination were rapidly retrieved under fluoroscopic control.

Intra-oral dental x-rays undertaken on-site as part of the odontological examination enabled rapid and non-invasive acquisition of postmortem data for comparison with available ante-mortem records.

All 56 bodies were identified within six days from the start of the investigation. Identification by dental records was the primary identification method in 74% of these cases.

All 1162 body parts were examined using digital radiography. The rapidity of examination and the wide dynamic range offered by digital imaging enabled bone fragments and teeth to be recovered for further examination and DNA testing. In many cases, the high resolution of the initial radiographs eliminated the need for further skeletal or dental radiography. Alteration of viewing parameters enabled visualization of both skeletal and soft tissue structures from the same image and enabled location and retrieval of both metallic and non-metallic foreign bodies and minimized the need to undertake more invasive physical examination of the soft tissues.

Conclusion: Use of modern radiographic imaging technologies contributed greatly to the speed of the pathology examination and identification process. Fluoroscopy and digital radiography enabled items of forensic evidence to be located and recovered very rapidly whilst minimizing the need for invasive procedures to be undertaken.

Radiology, Mass Disasters, Terrorism

D50 A Decade of Student Deaths at Purdue University - Are There Similarities?

Carrie K. Costello, BA, Purdue University Police Department/Tippecanoe County Coroner's Office, 205 South Intramural Drive, West Lafayette, IN 47906*

Participants of this presentation will be briefed on the ten year statistical overview and information gained in this research of deaths among Purdue University college student that can be utilized in analyzing the cause and manner of deaths with the focus on adjusting or implementing preventative measures related to these deaths.

This presentation will impact the forensic community and/or humanity by providing the forensic community with information gained through this research which can be analyzed for potential

implementation or improvement of services to college students in the area of suicide and homicide prevention. Being able to recognize and focus on the high risk students may also decrease suicide rate.

The ten year statistical overview and information gained in this research of deaths among Purdue University college students can be utilized in analyzing the cause and manner of deaths. The focus should be on adjusting or implementing preventative measures related to deaths among college students and improving or enhancing the college experience among co-eds. Review of the 121 death records, and law enforcement case reports revealed that a total number of 25 students committed suicide; three students were victims of homicide; 19 students died of natural causes; and 54 students died as a result of being involved in an automobile accident. The remaining 17 deaths were ruled either accidental or undetermined. In addition, the number of undergraduate student deaths was 91 and the graduate student deaths were 19, leaving 16 unknown of their collegiate status.

Homicide, Suicide, College Student

D51 Suicidal Hanging Resulting in Complete Decapitation: A Case Report

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Attendees will learn the criteria to differentiate suicidal or criminal decapitation that must be known by the forensic pathology community; and learn the contribution factors of a complete post hanging decapitation must be known by the forensic pathology community. This presentation will impact the forensic community by increasing the ability of forensic pathologists to correctly classify decapitations in hangings.

Death scene findings: A decapitated body was found in the morning by a jogger in a park beside a road bridge. The decapitated corpse lay against one pillar of a road bridge; a considerable amount of blood had splattered on the wall facing the neck stump. The wall was amply splattered with blood to a height of about one meter, indicating a vital arterial bleeding. The head was found five meters away from the trunk. A nylon rope was found tied to the base of a street lamp located on the bridge. The bridge was 7.20 meters from the road level. The lower end of the rope was 3.60 meters in length with a noose about ten mm in diameter. There was no evidence of a fight or any influence by another person at the discovery site. A handwritten letter of intent was found inside one trouser pocket of the deceased. The victim was identified from fingerprints; he was a 65-year-old man with no medical past history.

Postmortem findings: At the autopsy time the head and the torso were perfectly complementary with each other, without apparent loss of substance. The severance line passed through the low ventral to the high dorsal part of the upper cervical region and was a sharply clean edge. A band like abrasion pattern with rough-toothed margins around the skin of the neck was noted. The severance plane passed between the third and the fourth cervical vertebrae, with an intervertebral disc completely torn apart. The airway was severed at the trachea level, between the hyoid bone and the thyroid cartilage. The intima of the carotid arteries showed several horizontal tears and the adventitious showed some bruises. The entire severance plane showed marked extravasation blood in the tissue

of the wound surfaces. Blood aspiration was noted. Furthermore, a longitudinal rupture of the thoracic aorta, fractured ribs and a burst fracture of body of the twelfth dorsal vertebrae were noted. The toxicological analyses, including alcohol analyses, all yielded negative results. Skull and cervical spine x-rays showed air within the meningeal spaces and ventricles. No skull fracture was diagnosed. The severance plane of the cervical spine was between the third and the fourth cervical vertebrae. A dry bone study was realised and confirmed the cervical bone severance plane and found a fracture of the spinous process of the third cervical vertebra.

Discussion: Although hanging ranks among the internationally frequent suicide methods, decapitation is an unusual complication. It is not only rare but also has a medico-legal importance in relation to the causal mechanisms, differential diagnosis with a post-homicide decapitation and identification. Cases reports already exist in the forensic literature. Suicidal hanging is generally associated with soft-tissues injuries but osseous lesions of the cervical spine are unusual. Concerning complete post hanging decapitation, the section of soft tissues always occurs at the uppermost part of the neck and the cervical spine and breaks generally between the first and the second cervical vertebrae, sometimes between the second and the third cervical vertebrae. However, the authors observed the cervical spine broke between the third and the fourth cervical vertebrae with a fracture of the spinous process of the third vertebra. The authors discuss and compare this finding with the severance line previously described in the literature. Others findings as cranial and caudal wound edges, blood aspiration, vital reactions are compared to the literature cases. The following conditions as results of post hanging suicidal decapitation are summarized.

The complete mechanism of decapitation and autopsy findings are discussed, reviewed and compared to this case.

The fractures of the ribs and the thoracic vertebra were attributed to the shock against the wall.

A large iconography is presented to illustrate the findings on the death scene, at the autopsy time, on the radiographies and the dry bones.

Decapitation, Suicide, X-Rays

D52 Managing Intellectual Capital

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Attendees will be made aware of techniques to measure, increase, and retain intellectual capital to increase quality within their laboratories. This presentation will impact the forensic community by advancing unique performance metrics that can be used by forensic science to measure laboratory efficiency; offering strategies for communicating successfully with funding agencies; and demonstrating a case example of increasing the intellectual capital of a large metropolitan forensic science lab, using a forensic advisory group.

Introduction: Intellectual capital is a strategic resource in organizations. This article discusses strategies for increasing the intellectual capacity of the forensic science laboratory. It begins with a definition of intellectual capital using a resource-based model of organizations. Next, it discusses laboratory structure and the measurement of laboratory efficiency. Human resource metrics and the importance of communicating with funding agencies are considered.

The article concludes with a discussion of an overall strategy for increasing intellectual capital in forensic laboratories and offers a case example using a forensic advisory group.

Human Resources as Intellectual Capital: Demonstrating that investments in human resources lead to improved laboratory performance is critical to laboratory directors (Koussiafes 2004). Resource-based models propose matching the overall strategy of the organization with its human resource practices (Barney 2001). Originating from economics, the resource-based view considers human resources as assets as opposed to variable costs. The resource-based view is the philosophy behind initiatives to consider human resources as *intellectual capital*. In this model, human resource practices support the intellectual capital of the forensic laboratory by making the most of the job-related behaviors of the talent pool. Certain conditions must be present to maximize organizational performance. Intellectual capital must be *valuable, rare, inimitable, and nonsubstitutable* (Wright et al. 1994). These criteria are discussed next as they apply to forensic laboratories

Intellectual Capital, Management, Quality

D53 Promega Maxwell16™: A Simple and Integrated Solution for Small and Medium-Sized Laboratories

Michael P. Bjerke, MS, Curtis Knox, and Daniel Kephart, PhD, Promega Corporation, 2800 Woods Hollow Road, Madison, WI 53711*

Attendees will learn that additional opportunities exist for forensic laboratory for automated purification of STR-quality genomic DNA. This presentation will demonstrate a personalized instrument for the purification of genomic DNA.

Purification of genomic DNA for short tandem repeat (STR) analysis can be a tedious and time consuming process for any laboratory. Often there is a need to isolate DNA from a variety of sample sources such as whole blood, tissues, cells, and solid supports. As the number of forensic samples necessary for processing continues to climb, it's becoming more important for laboratories to automate this process. A number of automated liquid handling instruments have helped alleviate this bottleneck and streamline the purification process; however the dedicated equipment used in automated DNA isolation systems is typically expensive, highly specialized, and inflexible.

Promega has developed the Maxwell16™ System to provide maximum performance and flexibility in a simple, integrated reagent/instrument format. The Maxwell16™ instrument has been designed as a simple and robust purification platform with minimal training or maintenance and little setup time. The instrument occupies minimal laboratory bench space. The Maxwell16™ reagent cartridges come pre-filled with a variety of Promega reagent kits specified for optimal purification performance specific to sample type. The DNA IQ™ System reagent kit has been demonstrated for optimized isolation of genomic DNA from a wide variety of sample sources.

The Maxwell™ 16 system is designed to purify samples using Promega's DNA IQ™ Resin. The DNA IQ™ Resin is designed to optimize efficient purification product capture, washing, and elution. The Maxwell™ 16 instrument is a magnetic particle handling instrument that efficiently pre-processes liquid and solid samples, transports the magnetic DNA IQ™ Resin through purification reagents contained within the pre-filled cartridges, and mixes efficiently during processing. The efficient magnetic particle processing by the Maxwell™ 16 instrument avoids common automated purification headaches such as clogged tips, or partial reagent transfers that result in sub-optimal purification processing by other common automated purification instrument platforms. The system can process up to 16 samples in a single run. Purified concentrated products are high quality and ready for use in a variety of downstream applications, including STR analysis.

The authors will demonstrate the performance of Maxwell16™ System for the isolation of gDNA from a wide variety of tissue samples, blood, buccal swabs, and other forensic samples with yield, quality, cross-contamination, and STR profiles.

Genomic DNA, Short Tandem Repeat, Integrated

D54 Detecting Deceit: Exposing the Malingering

Peter Lourgos, MD, JD, Nishad Nadkarni, MD, and Erick A. Neu, PsyD, Circuit Court of Cook County, 2650 South California Avenue, 10th Floor, Chicago, IL 60608*

This presentation will provide attendees with a brief historical overview into the art and science of lie detection, with an introduction to the most recent advances in brain imaging technology. The forensic examiner will be able to identify common characteristics seen in malingerers, and once the potential malingerer is identified, the evaluator will be familiar with psychological instruments and other tools commonly used to help clarify the diagnosis. The presenters will also share practical clinical insights based on their experience working as forensic court-appointed examiners in one of the largest criminal court systems in the country (Cook County, Illinois).

Malingering – the intentional production of false or grossly exaggerated physical/ psychological symptoms motivated by external incentives – often presents itself within the course of forensic evaluations, bringing into question the integrity of the data gathered. Whether in the context of avoiding incarceration (criminal arena) or garnering potentially large monetary awards (civil arena), the probability of malingering increases with the value of the perceived gain, especially in the psychological realm. A forensic examiner is often left with the difficult task of separating truth from fabrication. Additionally, when there are no laboratory tests available to corroborate an examinee's self-report, this task becomes an exceedingly challenging one. Traditional tests of lie detection have been predicated on the theory that an individual who intentionally misleads experiences increased anxiety which can then be measured physiologically (*e.g.*, skin temperature, sweating, heart rate, etc). Unfortunately, the accuracy of such tests comes into question when the act of lying produces little, if any, anxiety.

General

D1 The Physical, Psychological, and Physiological Effects of Mefloquine on Armed Forces Personnel Re-Deploying From Combat Theaters

Pamela M. Callaway, MS, MFS, MA, United States Army, 20180 Selby Road, Waynesville, MO 65583; and Celia M. Story, MFS, Policy Branch, Headquarters, U.S. Army Criminal Investigation Command, Fort Belvoir, VA 22060*

Pathologists, psychiatrists, and investigators will learn about the preliminary survey results on the effects of mefloquine to soldiers returning from combat theaters of operation, to include Iraq, Afghanistan, Saudi Arabia, and Somalia.

It is important to know and understand the effect mefloquine may be having on U.S. soldiers fighting and dying, in a deployed area. If this preventative is having adverse effects, it may be causing them to act out violently toward others or succumbing to depression and taking their own lives. Equally important are the delayed effects on Reservists and National Guard soldiers returning to civilian life. This presentation will impact the forensic community and/or humanity by identifying this issue, which may be the first step in finding a more innocuous preventative for malaria for U.S. soldiers.

Mefloquine is an anti-malarial drug with a trade name of Larium. Studies have revealed mefloquine has been known to cause neuro-psychiatric adverse effects ranging from anxiety and paranoia to depression, hallucinations, psychotic behavior, and possible suicide. A history of depression, generalized anxiety disorder, or a psychotic or seizure disorder has been known to exacerbate the symptoms.

The authors conducted a preliminary self-reporting survey of military police personnel who have returned from combat theaters. All of the soldiers surveyed were administered mefloquine. Results will be provided to exhibit trends, or the lack of trends, pertaining to side effects.

The authors were given permission to conduct the survey among students attending the U.S. Army Military Police School. Since this was a preliminary survey instrument for future research, the results are not provided in an official military capacity and should not be construed as being the opinion of the Department of Defense, U.S. Army or the U.S. Army Military Police School.

Larium, Effects, Soldiers

D2 An Army Forensic Puzzle Solved

Susanna Rudy, RN, MSFS, University of California Medical Center at San Diego, 200 West Arbor Drive, San Diego, CA 92103; and David Flohr, MSFS, U.S. Army Crime Laboratory, 4555 North 2nd Street, Forest Park, GA 30297-5122*

After attending this presentation, pathologists, forensic nurses, and investigators will learn how to recognize the characteristic markings on the chest made by implementation of the First Access for Shock and Trauma (FAST-1) intraosseous infusion system used by emergency medical personnel for rapid sternal intraosseous infusion.

This presentation will impact the forensic community and/or humanity by educating forensic nurses, pathologists, and investigators to be able to identify this type of wound pattern should they encounter it in the future.

During an attack on U.S. forces in Iraq, a soldier died of wounds that were first thought to have been caused by a shotgun blast. At autopsy, numerous round steel pellets and minute pieces of olive green plastic were

removed from the victim's body. In addition, a circular pattern was noted on the victim's chest and a metal device was found under the skin in the center of the patterned impression. These items of evidence and images of the chest impression were submitted to the U.S. Army Criminal Investigation Laboratory for examination in an attempt to determine the source of origin for the pellets, plastic, metal device, and patterned impression.

The steel pellets and olive drab plastic were ultimately determined to be consistent with the types of materials used as the shrapnel and casing, respectively, for foreign anti-personnel hand grenades. This determination was supported by the presence of blast injuries suffered by the victim. But what was the cause of the circular pattern noted on the chest and what was the source of the metal object under the skin in the center of the pattern?

In an attempt to answer these questions, images of both the impression and the metallic device were posted on an Internet users group composed of individuals interested in forensic science applications of scanning electron microscopy. Though the web site is geared towards electron microscopy, perhaps some member of the group might recognize the pattern and metal object.

As a result of having cast a wide net, the answer to these questions quickly arrived. Susanna Rudy, a Registered Nurse, was serving as an intern in the Naval Criminal Investigation Regional Forensic Laboratory in San Diego as she worked on research for her MS in forensic science from National University in San Diego, California. Having read the scenario that accompanied the posted images, she e-mailed the images to her friends in the emergency medical field. Gary M. Vilke, MD and Associate Professor of Clinical Medicine, Medical Director, San Diego County Emergency Medical Services, responded: "The star pattern over the sternum with a central metal hollow tip makes it look like the tip of an intraosseous injection device. The FAST-1 intraosseous injector is utilized for sternal intraosseous infusion and has a threaded external end so that one can use a threaded removal device to extract the metal phalange after use (apparently not in this case)." Confirmation came from Michael W. Jacobs, Chairman/Founder, Pyng Medical Corporation, makers of the FAST-1 System.

FAST-1 Intraosseous System, Forensic Autopsy, Death Investigation

D3 VIRTOPSY® – Scientific Documentation, Reconstruction, and Animation in Forensics: Individual and Real 3-D Data Based Geo-Metric Approach Including Optical Body / Object Surface and Radiological CT / MRI Scanning

Michael J. Thali, MD, Ursula Buck, Marcel Braun, Peter Vock, MD, and Richard Dirnhofer, MD, University of Berne, Institute of Forensic Medicine, Berne, 3012, Switzerland*

After attending this presentation, attendees will learn the newest cutting edge technologies of 3-D documentation in forensic medicine. This presentation will impact the forensic community and/or humanity by demonstrating the possibilities of 3-D techniques in forensic.

Until today, most of the documentation of forensic relevant medical findings is limited to 2-D photography, 2-D conventional radiographs, sketches and verbal description. There are still some limitations of the classic documentation in forensic science especially if a 3-D documentation is necessary. The goal of this paper is to demonstrate new 3-D real data based geo-metric cutting-edge technology approaches. This paper present approaches to a 3-D geo-metric documentation of injuries on

the body surface and internal injuries in the living and deceased cases. Using modern imaging methods such as photogrammetry, optical surface and radiological CT / MRI scanning in combination it could be demonstrated that a real, full 3-D data based individual documentation of the body surface and internal structures is possible in a non-invasive and non-destructive manner. Using the data merging / fusing and animation possibilities, it is possible to answer reconstructive questions of the dynamic development of patterned injuries (morphologic imprints) and to evaluate the possibility, that they are matchable or linkable to suspected injury-causing instruments.

For the first time, to the authors' knowledge, the method of optical and radiological 3-D scanning was used to document the forensic relevant injuries of human body in combination with vehicle damages. By this complementary documentation approach, individual forensic real data based analysis and animation were possible linking body injuries to vehicle deformations or damages. These data allows conclusions to be drawn for automobile accident research, optimization of vehicle safety (pedestrian and passenger) and for further development of crash dummies. Real 3-D data based documentation opens a new horizon for scientific reconstruction and animation by bringing added value and a real quality improvement in forensic science.

Virtopsy®, Radiology, 3-D Surface Scanning

D4 Assessing Digital Photography: A Comparison of Crime Scene Photography Using Digital and Standard 35mm Film Based Cameras

Amanda L. Lokar, BA, BS, and Terry W. Fenger, PhD, Marshall University, Forensic Science Center, 1401 Forensic Science Drive, Huntington, WV 25701*

The goal of this presentation is to inform the forensic community about research comparing digital and film based 35mm cameras used for crime scene photography and present photographs from crime scenes using digital camera technology.

This presentation will impact the forensic community and/or humanity by serving as a starting point for agencies that need validation of digital technology before a decision can be reached on the conversion from film-based cameras to digital technology. This poster will show that there are many advantages to moving toward digital technology, and that the technology is a valid replacement for standard 35mm film-based cameras.

The goal of the research is to validate of the use of digital imaging as a replacement for standard 35 mm photography to document crime scenes. The research methodology involved crime scene photography, where two photographers documented crime scenes in duplicate. One photographer utilized a digital camera and a crime scene used a standard 35mm for comparison purposes. The parallel photography method was used on a variety of scenes, including homicides, suicides, unknown deaths, and cars processed in the evidence cage. The digital camera used for this study was the Nikon 5700 SLR 5.0 mega pixel camera. The crime scene technicians used a Pentax® K1000 camera with a 28-70mm zoom lens. The film used was Kodak 35mm color film with ISO 100. After digital picture capture to a 256 MB CompactFlash™ card, the images were then downloaded to a computer, saved to CD-ROM, and then printed. The pictures were then compared to the 35mm film prints by side-by-side visual comparisons.

The results showed very little difference between the standard 35mm and the digital pictures. In many cases, the digital pictures were actually clearer and represented the scene more accurately than the standard 35mm. In instances of close proximity to object of focus, the on-board flash was sufficient for scene illumination. However, in other instances such as the evidence-processing cage, the on-board flash was inadequate and produced images that were much darker than the 35mm prints that utilized a detachable sync cord attached flash.

The conclusion reached by this research is that digital photography at crime scenes can be as good as traditional methods, if not better in some instances. The digital camera had some shortcomings, especially concerning the flash. The flash problem could be easily remedied by using a detachable flash with the available hot shoe mounted on the camera. More research can and should still be explored in this area using the parallel scene method.

Over the course of this study, it was found that more law enforcement agencies have already made the switch to digital or are in the process of researching the method to make the conversion to digital. As technology improves, it is likely that more agencies will be moving to digital photography. A possible reason for the switch is a monetary savings, much needed by agencies that are incurring budget cuts. After the initial expenditure for conversion, one agency reported a savings of about six thousand dollars a year over film-based processing.

One of the stumbling blocks for the digital conversion is the technology's acceptance in the court system. Out of the thirteen agencies polled, seven of the agencies are using digital in some capacity for crime scene documentation. Of those seven agencies, there were no problems reported with court acceptance of the digital images. The Scientific Working Group of Imaging Technology (SWGIT) has created guidelines for the use of digital images in criminal justice system. Agencies should consider these guidelines and clearly define procedures for image captures, processing, and storage to properly account for images in the event of a court challenge to the technology.

The research presented may be able to serve as a starting point for agencies that need validation of digital technology before a decision can be reached on the conversion from one technology to another. Before considering the conversion to any new technology, law enforcement agencies should speak with district attorney's in their system to determine the probability of court acceptance. Agencies considering the conversion should also explore the cost of the conversion, any change in yearly cost (positively or negatively), and determine a set of standard operating procedures that will follow SWGIT guidelines and best suit their organization.

Digital Cameras, Crime Scene Photography, Digital Imaging

D5 Child Abuse: Physical Abuse

Diana K. Faugno, BSN, RN, Palomar Medical Centre, 555 East Valley Parkway, Escondido, CA 92025*

Attendees will be able to review healing injury photos of a case of child abuse and understand the court outcome, which will be discussed based on the prosecution's understanding of the findings.

This presentation will impact the forensic community and/or humanity by demonstrating to the audience that not all anal injury is sexual abuse.

The police rescued a 4-year-old Spanish-speaking male. The child had multiple bruises, burns, and patterned injuries all over his body. He was taken to Children's Hospital, where he was evaluated for his injuries. It is noted he had a bruise around his penis. A Spanish speaking forensic interview obtained a history of a bar of soap being "shoved up my butt and it hurt."

A forensic sexual abuse examination was completed seven (7) days after his initial evaluation. There were multiple areas of healing noted all over his body with fading bruises, burns, and patterned injury. His eyelashes are at varying lengths. His anus showed a healing laceration at 6 o'clock. This injury was consistent with the time frame and history stated.

Both the mother and significant other were arrested and placed in jail. The court case occurred eight (8) months later with the defense accepting a plea bargain of a required eight (8) years served before parole for both of them.

Key Point: The intent of shoving the soap bar into the anus was not sexual.

D6 Burns by Electric Burner Plate: A Case Study

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The objective of this study is to characterize burns caused by an electric burner plate. This presentation will impact the forensic community and/or humanity by providing more information regarding burn injuries.

The case presentation involves a 30-year-old woman who was found unconscious in her kitchen at 8:00 p.m. She was lying supine on the floor in front of an electric cooker. A wide burn was observed on the left side of her face (from eyebrow to chin and from nose to cheek). Another "arborescent" burn was present on the anterior side of the neck. Severe burns involved also the extremities of the first and the second finger of the right hand. There was no evidence of any other burned areas neither on the body and clothes. All four plates of the electric cooker were incandescent when the woman was found. Empty rum bottles and blister pack of Temazepam pills were found in the living room.

The woman was carried in hospital where her blood tested positive for a large amount of alcohol and benzodiazepines. After the emergency treatment, she fully recovered from the coma but she did not remember what happened after 6:30 p.m. when she deliberately took pills and alcohol with the purpose to get a long sleep. The accident was initially considered a suicide attempt and investigations were not conducted.

Three months later, the case came to the attention of the public prosecutor. A man who had previously inflicted injuries to the victim and recently made threats against her was identified. The prosecutor asked the authors to reconstruct the circumstances of burn trauma, focusing their attention on the nature of injuring action. Were the burns accidental, self-inflicted, or inflicted by an assailant? At that point, the available evidence consisted of a few photographs of the victims taken in hospital two weeks after the trauma and the "crime scene," taking into consideration that the flat had been well cleaned in the meantime.

Extensive testing was conducted on the etiology of burns and the mechanics of injury. These results were compared with those obtained from the crime scene analysis. The location of the cooker in the kitchen and its dimensions were incongruous both with an accidental fall or an intentional action. Against the first possibility, the electric cooker was not wide enough to allow a full and balanced support of the upper part of the body for a prolonged contact between face and plates. Further, as all four plates were found incandescent, this reconstruction was denied by the absence of any other burned area on the body or clothes.

Against the second hypothesis, the height of the electric cooker surface would require a deep flexion of the upper part of the body (more than 90°). The women would be unable to balance in this position just holding the cooker, considering the elevated concentration of drugs and alcohol detected in her blood. Both substances have a well-known miorilaxant activity and they interfere with the ability to maintain her equilibrium.

In conclusion, the reconstruction strongly suggested an intentionally inflicted violence.

Indeed, despite the initial lack of disclosure, an inflicted etiology was supported by a multidisciplinary analysis involving the study of characteristics of unique burn pattern injuries, victim general conditions, and crime scene investigations.

D7 Is Pediatric Death Investigation Enhanced by the Credentials of the Investigator?

Dawn M. Zulaw*, Mary G. Ripple, MD, and David R. Fowler, MD, Office of the Chief Medical Examiner, State of Maryland, 111 Penn Street, Baltimore, MD 21201

The purpose of this poster is to determine if credentials of an investigator enhance information gathering during the initial phase of child death investigation. This presentation will impact the forensic community and/or humanity by helping attendees to realize what credentials would be required for the development of dedicated pediatric investigators.

Like many other states in the nation, Maryland appoints people as investigators. Each brings their unique experiences and each person has varying credentials. Maryland has a detailed child death protocol that requires the forensic investigators or deputy medical examiners to inspect the child at the location where they are pronounced, to investigate the scene where they were last known alive, and to interview witnesses and family. In addition to the standard investigation report, a lengthy child death investigation protocol must be completed. A lack of total compliance with the child death protocol has been recognized. Many possible variables were the length of time required to complete the protocol, the interrupted flow of the investigation tool, the cooperation of the investigating police agency, the comfort level of the investigator, and lastly the credentials of the forensic investigator or deputy medical examiner. It has been suggested that the comfort level of the investigator often depends on their credentials. The investigators were divided into groups based on their credentials: physicians, nurses, pre-hospital providers, and those with no medical credentials. A five-year evaluation determined which group of investigators had the most complete data and highest compliance with the protocol procedures. The case data evaluation was based upon compliance with the entire protocol and the type of data collected during the initial phase of the investigation. The investigation tool was broken down into these categories: demographics, social history, birth mother's medical history and scene evaluation, and scene response. Each tool was evaluated for the presence of required information. A statistical comparison of results of the credentials of the investigators was performed. Geographic trends were taken into consideration. The results indicated that the most highly educated professionals had the lowest compliance rate and geographic trends tended to support this finding.

Forensic investigators are appointed to complete scene investigations for the medical examiner. Minimum qualifications are two years of trauma experience or thirty college credits in the science, forensics, or a related field of study. A county deputy medical examiner is an appointed physician who performs the same duties as the forensic investigator with the exception that they can complete a death certificate for cases that do not require an autopsy. Deputy medical examiners may or may not have formal training in forensics other than that provided by the authors' office in Baltimore. A child is defined as less than two years of age. The Maryland Child Death Protocol is a procedure which requires the investigating deputy medical examiner or the forensic investigator to complete all of the following: inspect the body at the location where it was pronounced, inspect the scene where the subject was last known alive, obtain photograph, obtain pertinent records, retrieve medications, retrieve admission lab samples, interview the family and the witnesses, and discuss the case with the police. Medical examiner jurisdiction is determined by the physical location at which the child was pronounced; therefore, cases which were determined to be a Maryland Medical Examiner's case but the incident location was not in Maryland were excluded. Staffing limitations prevent Baltimore City Forensic investigators from completing the entire child death protocol. The homicide detective will often evaluate the scene of the incident, interview the family, and supply the information required for the Child Death Investigation Form. Due to the described operational differences, Baltimore City cases were excluded. There are some occasions where warrants were necessary and the police restrict access to the scene or to witnesses. Cases where it is documented that the investigation police agency did not allow protocol compliance were

excluded.

It has been suggested that a group of dedicated pediatric investigators would provide a higher level of investigations. The impedance of this study was to determine which credentials, if any, a pediatric investigator should have.

Child Death Protocol, Investigation, Jurisdiction

D8 Accidental Death Resulting From Acetylene Cylinder Impact

Mukta Rani, MD, DNB, Department of Forensic Medicine, Maulana Azad Medical College, Bahadurshah Shah Zafar Marg, New Delhi, 110002, India; Aneesh Gupta, MD*, Medical Examiner's Office, Wayne County, 1300 East Warren Avenue, Detroit, MI 48207; and P.C. Dikshit, MD, LLB, Anil Aggarwal, MD, and Vijay Dhankar, MBBS, Department of Forensic Medicine, Maulana Azad Medical College, Bahadurshah Shah Zafar Marg, New Delhi, 110002, India

After attending this presentation, attendees will learn the scenario of occupational injuries in a developing country like India. This presentation will impact the forensic community and/or humanity by providing a better understanding of the blast effect from a low impact explosion and better recommendations for occupational safety.

Case report: A 34-year-old male welder sustained injuries resulting from the impact by the upper part of acetylene production and storage cylinder while examining the gas pressure. The valve (V) in this device had rusted, allowing the build-up of dangerously high pressure of acetylene gas. He went on infusing calcium carbide into the cylinder, until the rising pressure within it caused the explosion. In this explosion, the upper part (U) of the device blew out and struck him on the face. At the time of the incident, he was bent over the device, supposedly checking the apparatus. This caused his upper part of the body – including the face – to be exposed to the full blast of the explosion.

After the incident the upper part the cylinder along with the victim was found lying at a distance of about one and half feet from the lower container as shown in figure 3. The body of the welder was lying in a pool of blood as shown in figure 4. The body was shifted to the mortuary of

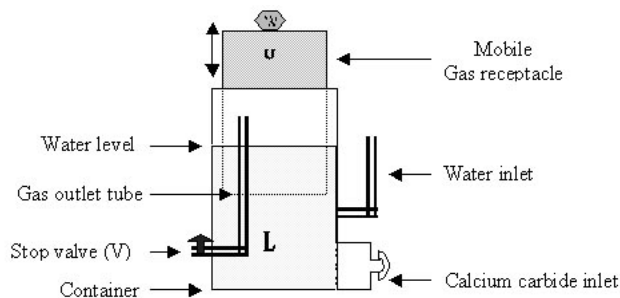


Figure 1. Schematic diagram of The improvised acetylene tank

Maulana Azad Medical College, Delhi for the autopsy.

Autopsy findings: On examination of the body, dried blood was seen adherent to the head, face, neck, and chest. Blood was oozing out from both nostrils. Multiple abrasions were present over the right ear, face, front of neck, and upper chest with a black eye on the right side. Multiple lacerated wounds were present over the lower lip and chin (figure 5). There were multiple bruises over the face, front of neck, shoulder, upper chest (figure 6) and left buttock. There were multiple fracture dislocations of maxilla and mandible, along with loosening of upper incisors. There was transection of trachea, vessels and bruising of neck muscle above the

thyroid cartilage (figure 7). There were bilateral sterno-clavicular and acromio-clavicular joint dislocations and multiple fractures of all the ribs accompanied by effusion of blood around. A contusion about 8x6 cm was present over the frontal area of scalp. There were fissured fractures of anterior cranial fossae of the base of skull. Brain showed contusion laceration of the undersurface of both frontal lobes. Sub-dural and sub-arachnoid hemorrhage was present all over the brain parenchyma. There were no lesions to the other internal organs and all toxicological analyses were negative.

The autopsy results showed that the death has been caused due to hemorrhagic shock and cranio-cerebral damage consequent upon injuries to the neck structures and head respectively. The injuries were produced by blunt force impact to head and neck resulting from the accidental impact of an acetylene cylinder.

In the present case, the examination of the cylinder revealed the rusting of several components of the cylinder – including the safety valve. The cylinder was country made and did not adhere to the specifications issued by Bureau of Indian Standards (BIS). It was in use for more than 10 years and service and repairs were pending. The rusting of the components decreased the free movement of the cylinder along with the rusted release valve. There was an increase in pressure of more than 15psi, resulting in degradation of acetylene and non-functioning of oxy-acetylene flame. Due to lack of knowledge the welder infused more chemical reaction to increase the supply of acetylene gas. The explosion occurred as he checked the gas pressure and increased it manually. Explosion of the cylinder led to the flying off of the upper part of the cylinder, which hit the welder on his head, neck and chest. The external injuries off the welder corresponded to the detached upper part of the acetylene cylinder.

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Acetylene, Cylinder Blast, Blast Effects

D9 An Evaluation of the Lethal Traffic Accidents in Crete During 1998-2004

Elena Kranioti, MD, Department of Forensic Pathology, University Hospital of Heraklion, Medical School University of Crete, Greece; Ersi Abaci Kalfoglou PhD and Munevver Acikkol PhD, Institute of Forensic Sciences Istanbul University 34303 Istanbul Turkey; and Manolis Michalodimitrakis MD, JD, Department of Forensic Pathology, University Hospital of Heraklion, Medical School University of Crete, Greece

Drug use is considered to be one of the most important contributors to traffic accidents. It has been shown by numerous studies that blood alcohol levels exceeding 0.1 g per 100 ml increases the crash risk. It is also very well known that many drugs like cannabis, benzodiazepines, and opiate like drugs such as heroin, morphine, methadone, and amphetamines impair driving skills. While the basic effects of drugs on performance can be expected to be comparable in different nations, the drug related accident risk may vary due to different driving habits, structure and density of traffic and so on. Therefore, it seemed to be interesting to study the situation in Crete, knowing that the fatal traffic accidents in Greece are more than 18,000 per year placing the country in the first place within the European

Union.

In this study, the authors collected the data from the of the fatal traffic accidents that occurred in Crete during 1998-2004. They were classified as to their number, number of deaths per accident, the seasonal and monthly distribution (since there are serious seasonal fluctuations in the number of inhabitants during winter and summer time), the time and the rate during the week, and the age distribution of the deaths.

The authors concluded that the maximum number is reached in summer and on Sundays, the highest value being in September. The age distribution showed a maximum between 21- 30 years of age. The second part of the study was to correlate the values with the toxicological analysis outcome of the above-mentioned accidents. Alcohol, opiates, cannabinoids, and benzodiazepines were tested and compared with the parameters studied. The overall positive outcome was the observation of a general decrease in the fatal traffic accidents as compared to the last ten years

Forensic Toxicology, Driving, Crash Risk

D10 Statistical Distributions of Suicide in Tarrant County

Lauralee Harris, MPA, Mental Health Association of Tarrant County, 3136 West 4th Street, Fort Worth, TX 76107; and Nannapega Zachariah, PhD*, Tarrant County Medical Examiner's Office, 200 Feliks Gwozdz Place, Fort Worth, TX 76104*

After attending this presentation, attendees will understand a useful format for the Medical Examiner's Office to assist the community in development of suicide statistical information and demographics for epidemiological purposes and for prevention and education efforts.

This presentation will impact the forensic community and/or humanity by encouraging the forensic community to understand their importance in presenting accurate information and developing statistical reports to assist community efforts in suicide prevention and education.

Methods: All 523 cases of suicide examined by the Tarrant County Medical Examiner in the years 2000-2003 were reviewed. The study was conducted at the Medical Examiner's office, using the Medical Examiner's computerized records. Individual deidentified case data were analyzed by staff of the Health Intelligence Center of the Tarrant County Public Health Department using SPSS and Geographic Information System (GIS) technology. The U.S. Census 2000 was used for population rates. Suicide rates for the U.S. were obtained from the Centers for Disease Control and Prevention, and for Texas from the Texas Department of Health, Vital Statistics Department.

Results: The suicide rate has varied somewhat in Tarrant County over the four years of this study.

- Overall rates: 2000/8.3 2001/8.68 2002/7.99 2003/10.27
- Youth 24 & under rates: 2000/5.09 2001/3.72 2002/2.85 2003/3.71
- Adult over 24: 2000/10.4 2001/11.71 2002/11.11 2003/14.21
- Males are at 4.8 times the risk for committing suicide as females
- The highest rate per 100,000 of population is in males over the age of 75
- Although more white youth commit suicide, the highest rate is in black youth
- Some zip codes in Tarrant County have both a higher incidence of suicide and higher rate per 100,000 population than most other zip codes
- For adults there is little pattern between zip codes for the years
- For youth the suicide rates by zip code indicated some zip codes have higher rates each year

Implications:

- Periodic analysis of suicide data can assist the community in evaluating trends.
- Understanding trends can assist the community in developing

public health education and intervention strategies to prevent suicide.

- It is critical that the Medical Examiner, law enforcement and medical facilities present information as accurately as possible regarding suicide.
- Medical Examiner investigative reports can be especially helpful in differential diagnosis between suicide and accidental death when intent may be unclear.
- ME reports are especially important when cause of death is substance related. Undercounts of the incidence of suicide may cause a community to underestimate the impact of suicide.
- It is especially important that supportive analytical instruments and tests, such as hair analysis be used to determine substance use. Many substances can lead to periods of severe depression even weeks after they are discontinued, and may not show on routine toxicology tests. A better understanding of the contribution of substances, including prescription medications, is needed in the effort to prevent suicide.

Suicide, Suicide Rates, Tarrant County

D11 The History of the Scientific Working Group on Digital Evidence and the New Forensic Science Discipline for Evidence

Carrie M. Whitcomb, MSFS, National Center for Forensic Science, PO Box 162367, Orlando, FL 32816-2367*

After attending this presentation, attendees will understand the benefits of having an international certification program for many types of digital media based on the criteria and to describe the numerous positive outcomes of having such a program.

This presentation will impact the forensic community and/or humanity by stimulating a discussion in the community and to gain the benefit of ideas generated as this topic is discussed.

In the 1980s, investigators were encountering and seizing computers as evidence in their investigations. In the mid to late 1980's, forensic laboratories in Washington, DC were receiving cases that had computers along with other types of physical evidence. These laboratory submissions started a search for the answer to the questions: "What is the role of the forensic laboratory for computer evidence?" This topic of discussion continues today. The early history of forensic digital evidence involved an ad hoc group in the Washington, DC area, referred to as the Federal Crime Laboratory Directors. They meet two times a year to exchange information about their agencies and discuss topics of mutual concern. It was after two such meetings at that U.S. Postal Inspection Service Laboratory in Dulles, VA in early 1998 that, what is known today as the Scientific Working Group on Digital Evidence (SWGDE) was formed. SWGDE defined digital evidence as "information of probative value that is stored or transmitter in a binary form." SWGDE defined other terms related to digital evidence.

At the International Association of Forensic Sciences (IAFS) in Los Angeles at UCLA in 1999, the Executive Committee of SWGDE arranged for the first forensic science session in the U.S. related to digital evidence. Workshops by SWGDE regarding the establishment of a digital evidence section in forensic laboratories followed at the American Academy of Forensic Science thereafter. The American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB) recognized digital evidence as a sub-discipline in their accreditation program in 2003.

Currently, SWGDE has developed the first version of a "Best Practices" guide that is available at www.swgde.org along with several other final documents and draft documents for public review and comment. New challenges are continually facing the digital evidence examiners who must be able to forensically collect, preserve, store and examine various formats of digital evidence as the volume of data and new forms of technology increase exponentially. The scientific integrity must be

maintained.

Digital Evidence, History, SWGDE

D12 The Rational for International Certification for Digital Evidence Professionals

Carrie M. Whitcomb, MSFS, National Center for Forensic Science, PO Box 162367, Orlando, FL 32816-2367*

After attending this presentation, attendees will understand the benefits of having an international certification program for many types of digital media based on the criteria and to describe the numerous positive outcomes of having such a program.

This presentation will impact the forensic community and/or humanity by stimulating a discussion in the community and to gain the benefit of ideas generated as this topic is discussed.

People, training, education and objects can be certified. Certification indicates that "X" has met criteria of performance standards established by a consensus of experts. Whether referring to a person who is a Board Certified Forensic Pathologist, or a certified brake installation on an airplane, basic criteria must be met that demonstrate a specified competency for the awarded certification. Professional certification evolves in response to external demands placed on a profession or a subset of expertise or internally from a need recognized within that community.

In the case of crimes related to digital evidence and the subsequent forensic examination of digital evidence, there is pressure from the courts and from international organizations, to establish standards and definitions for the international exchange of digital evidence. In the law enforcement and forensic science communities, it has become apparent to many that a coordinated effort is needed in this area. The establishment of international professional performance standards by the professionals who work in this field seems reasonable and necessary. Professional certification currently exists for several forensic science disciplines. The establishment of certification standards would help insure that crime scene experts who collect digital evidence, forensic examiners who examine the recovered digital evidence and the investigator who analyzes the digital evidence would all be applying the same principles and standards in their activities, written reports and in court testimony. The basic areas of 1) collection and preservation, 2) examination, and 3) analysis may be performed by one person or three separate individuals. However, the basic principles must be followed throughout. Professionals can easily list the knowledge, skills and abilities and attitudes (KSAs) that are needed to perform the various tasks related collecting, preserving, examining and analyzing digital evidence. These KSAs would form the basis for the certification questions and practical examinations. Ethics will be the cornerstone for the attitudes required.

International Certification, Digital Evidence Professionals, Competency Based Certification

D13 Digital Evidence Forensic Education: Computers, Forensics, and the Future

Mark M. Pollitt, MS, Digital Evidence Professional Services, Inc., PO Box 1309, Ellicott City, MD 21041*

After attending this presentation, attendees will learn about the history and present state of digital evidence forensic education and how it may evolve in the future.

This presentation will impact the forensic community and/or humanity by providing factual information about digital forensics to the forensic science community, help to build bridges between traditional forensic science disciplines and digital forensics, and provide a frame of reference for educators from both the computer and forensic science

communities. The result will be better service to the general public and the capability to provide critical services in the Information Age.

As defined by the Scientific Working Group on Digital Evidence; digital evidence is information of probative value, stored or transmitted in binary form. The forensic examination of computer hard drives, tapes, and disks have been done for well over a decade. Initially the work was done by criminal investigators in the field and in their offices. With some support from the private sector, organizations and agencies began to develop training programs to teach both the technology and the forensic techniques. In this initial phase, the vast majority of digital forensics was done by people whose education and training was neither forensic science nor computer science.

As the volume and capacity of digital devices grew exponentially, the need for specialized training and education grew. Since digital evidence starts as physical evidence and the goals of a forensic examination are the same for traditional forms of latent evidence as digital evidence, crime laboratories started to develop programs for the examination of digital evidence. Many laboratories began their program by training scientists from traditional disciplines, such as chemists, document examiners, and engineers, in this new field. A new form of forensic laboratory came on the scene; it was the Regional Computer Forensic Laboratory, which focused entirely on the examination of digital evidence.

At the turn of the millennium, computer scientists turned their attention to the problems of computer security and infrastructure protection. It was clear that society's dependence on information, computers, and network communication needed attention. The Federal government established a pair of scholarship and capacity-building programs supported by the National Science Foundation and the National Security Agency, collectively called the Cyber Corps, to increase the quality and quantity of computer scientists that could be employed in the computer security and infrastructure protection. One of the tenants of this new focus on infrastructure protection was that after assets were protected, there needed to be a means to detect adverse activity and then to react to these events. Computer scientists recognized that digital forensics could play a very important role in the detection and reaction phases of infrastructure protection. As a result, traditional computer scientists became interested in digital forensics. One effect of this new attention was that traditional computer scientists began to study forensic science methods and techniques.

In 2003, digital evidence won acceptance as a forensic science with its acceptance as a discipline subject to accreditation by the American Society of Crime Laboratory Directors – Laboratory Accreditation Board. With this acceptance has come rapid adoption of many of the traditional forensic science features, including formal education. This occurred at exactly the same time as computer scientists participating in the Cyber Corps program were becoming interested in forensics.

In early 2003, a group was established, with the support of the FBI Regional Computer Forensics Laboratory Program and the University of Tulsa, which was comprised of faculty from a number of Cyber Corps colleges and universities, forensic science faculty, and digital evidence forensic practitioners from law enforcement and crime laboratories. This group has become known as the Computer Forensic Educators Working Group. In part due to this organization, colleges and universities offering digital forensic courses has grown dramatically and many are beginning to offer certificates and concentrations in digital forensics. Full degrees in digital forensics are not far in the future. It is remarkable that this is occurring at the same time that traditional forensic science educational programs are seeking accreditation.

This presentation will explore how these parallel histories might collide and how the resulting synergy can only benefit the entire forensic science community.

Digital Evidence, Forensic Education, Cyber Corps

D14 Identification of Known Files on Computer Systems

*Douglas White**; and *Michael Ogata*, National Institute of Standards and Technology, 100 Bureau Drive STOP 8970, Gaithersburg, MD 20899-8970

After attending this presentation, attendees will learn about identification of known computer files and be able to implement automated processes to eliminate such files in their computer forensic practice.

This presentation will impact the forensic community and/or humanity by introducing one method of reducing the data in digital forensics cases.

The amount of data involved in digital forensics investigation can be greatly reduced by automated means by eliminating known files from computer systems. The method used to obtain the data reduction is based upon the National Institute of Standards and Technology (NIST) National Software Reference Library (NSRL) data set. The NSRL data set can be applied to several different operating systems and can be used with several off-the-shelf commercial software tools. In laboratory tests, data reduction up to 95% has been obtained, while in the field, rates of up to 80% have been obtained.

The National Institute of Standards and Technology (NIST) hosts a project that promotes efficient and effective use of computer technology in the investigation of crimes involving computers. The National Software Reference Library (NSRL) is designed to collect software from various sources and incorporate file profiles computed from this software into a Reference Data Set (RDS) of information. The RDS is a collection of digital signatures of known, traceable software applications.

Numerous organizations including law enforcement, government, and industry use the NSRL data set to reduce the amount of data involved in digital forensics cases. The NIST data is collected with the requirement of court admissibility. While a courtroom may not be the destination of the investigation, the possibility is not excluded due to this data set.

The RDS is a free resource. Instructions for obtaining the RDS will be given. Technical descriptions of the contents of the RDS will be briefly discussed. Methods to use the RDS to identify file “pedigrees” and application relationships will be shown.

Several commercial computer forensics software tools exist that leverage the information from the NSRL. Tips on use of these tools will be provided.

A collection of laboratory measurements of the application of the NSRL data set to known reference computer systems will be presented, to give the theoretical upper bound of data reduction capabilities. This will be followed by a presentation of similar real-world systems processed with the same methodology to show more realistic response.

Computer, File, Identification

D15 Validation Results From the European Project FEARID on Forensic Ear Print Identification

*Ivo Alberink, PhD**; and *Arnout C. Ruijrok, PhD*, Netherlands Forensic Institute, Volmerlaan 17, Rijswijk, 2288 GD, Netherlands

After attending this presentation, attendees will understand quality issues concerning a standardized operating procedure for collecting ear prints.

This presentation will impact the forensic community and/or humanity by presenting validation issues concerning the strength of

evidence of ear prints.

As part of the Forensic Ear Identification (FearID) research project, which aims at obtaining estimators for the strength of evidence of ear prints found on crime scenes, a sample of ear prints has been collected. The method of ear print collection will have critical consequences for the subsequent analysis and results.

The project has produced a report stating the standard operating procedure (SOP) for taking the prints. This describes in detail e.g. what equipment to use, when and how to clean surfaces of the equipment, how to lift the ear prints and how to instruct ear print donors. In this way it should be guaranteed that when using different equipment, investigators, locations etcetera, the circumstances do not influence the prints too much.

When lifting an ear mark from a scene of crime, an investigating officer will first dust the area of the print. After this a “lifter” will be used to extract the mark from the surface. In the Netherlands, to this end the medium Black Gel Lifter (BGL) is used mostly. Ear prints (marks) gathered thus are referred to as *second-generation* prints. In addition to this, there are methods of taking ear prints not via a surface but immediately off the ear, thus producing *first generation* prints. For the validation experiment, besides using the medium BGL, we also took prints using the first generation method referred to as Inkless Impression Kit (IIK).

Two fundamental issues concerning the design of the operating procedure for taking ear prints, and the applicability of the eventual results, are the following:

1. *Repeatability*: Are ear prints from the same individual, taken repeatedly under the same circumstances by the same operator sufficiently similar?
2. *Reproducibility*: Are ear prints from the same individual, taken repeatedly under different circumstances by different operators sufficiently similar?

The answers to these questions provide information about the quality of the procedure.

An experiment has been performed to investigate the above. In order to evaluate the outcomes of the experiment, features were needed to decide when two prints are “alike.” We note that finding such features is the main topic of the project, so it was not clear beforehand which features are most appropriate.

Using both mean grey-value and anatomical measures for the comparison of prints, clear effects can be seen of country, donor, donor ear, operator and consecutive runs on the resulting ear prints when using the medium BGL. For the medium IIK operator and run effects are less when using mean grey-value and not significant when using anatomical measures.

Since it does not seem to be feasible to further adjust the procedure, we are currently exploring features that are less sensitive to country, operator and run effects.

Ear Print Identification, Validation, Operating Procedure

D16 Accurate Forensic Video Superimposition Through Computational 2-D to 3-D Multi-View Registration (Towards Computational Techniques for Image-Shape Based Cranial/Facial Comparison)

*Lenny Rudin, PhD**, Cognitech, 225 South Lake Avenue, Suite 601, Pasadena, CA 91101-3010

The goal of this presentation is to build a rigorous mathematical formulation for scientific computational methods of Shape-to-Image comparisons, for shapes approximating human head/face; provide accurate Forensic Video Superimposition through Computational 2-D to 3-D Multi-View Registration; and to provide mathematical analysis of the sources and estimates of errors.

This presentation will impact the forensic community and/or

humanity by providing new computational methods for Image-Shape based Cranial/Facial comparisons, which can be used in the forensic process of Virtual Superimposition, with the critical shape (head/ skull) angles-position parameters estimated automatically, thus introducing the smallest possible error. In addition, this method enables comparison between individuals head/face captured on a video sequence, to a database of prior scanned 3-D head/face shapes for known individuals, thus enabling a Virtual Line-up comparison. Mathematical analysis of the sources and effect of error in 2-D to 3-D registration process, may help to establish the boundaries for the acceptance-rejection identification decisions.

Video Superimposition techniques are used by forensic scientists to assist in identification of unknown skulls, through comparison with antemortem photographs of individuals. The critical variables that determine accuracy of this comparison process are geometrical quantities: orientation, scale, and comparison features. There is no statistical or mathematical theory that estimates accuracy and error of the above experimental procedure. In fact it is not known if some features (landmarks) are more stable than other to be used in the matching process. If several photographic views are available, or a recorded video sequence of the individual in question exists, the straight forward and profile views are considered more reliable, since the oblique views are 'difficult to match'. Analysis of the superposition consists in estimating resulting concordance of anthropometric features and regions of the re-projected skull-to- photo blended image. Here, again, there are no rigorous criteria for estimating the degree of match. Rather, a qualitative comparison ranking is practiced to state the degree of similarity or dissimilarity between the shape of the skull and the photographic image examined. Thus the superimposition technique is mostly used as a non-quantitative exclusionary tool, and not for positive identification or rejection.

Recent advances in 3-D scanning technology introduced portable, and reasonably accurate 3-D laser scanning cameras that can be used to extract 3-D shape of objects, including skulls and human heads/ faces. This also opens a possibility to compare photographs and face/head shapes for living subjects, where the solid 3-D model will be used instead of the human skull. A mathematical matching procedure can be formulated to 'match' a single view, or a sequence of views, to the scanned model.

The author proposes to reformulate the problem of Video Superimposition as a 2-D to 3-D Registration task where single or multiple views of the same individual are registered to a set of a prior known solid head/face models. This registration process shall be invariant to orientation and scale, thus resolving this above-mentioned basic problem of manual Video Superposition. If only a single view is available, and if the comparison features to be matched are reduced to a set of 2-D and 3-D points, we apply relatively straightforward least-square algorithm. If a sequence of views (as in video) is available, we describe results of a novel multi-frame *coupled* algorithm that yields optimal mapping of all the available views (e.g. from video frames) onto the 3-D model.

The above registration process may yield optimal match (minimal optimization error) for several 3-D candidates' models. The question however remains: does the examined 3-D model "fit or misfit" the image view (or the sequence of image views)? The outcome of this will determine if possible identification or exclusion of the subject is obtained. To have some progress in this last question, a study of structure is proposed, rather than size of the error function. The proposed method will enable search/comparison of the head/face images of individuals with respect to a database of 3-D face/head scans, thus making images of humans as useful as fingerprints databases are.

Image to 3-D Shape Registration, Virtual Line-Up, Automatic Computational Superimposition

D17 Extracting Forensic Information From Biometric Devices

Zeno J. Geradts, PhD, NFI, Laan van Ypenburg 6, Den Haag, 2490 AA, Netherlands; and Arnout C. Ruijrok, PhD, and Jurrien Bijhold, PhD, NFI, Volmerlaan 17, Rijswijk, 2288 GD, Netherlands*

The goal of this presentation is to describe forensic information that can be extracted from biometric devices and methods for spoofing biometric devices.

This presentation will impact the forensic community and/or humanity by presenting an overview of the forensic value of data from biometric systems.

In the last decade, both industry and governments have started to contribute to ever larger projects on biometric devices. Terrorism has highlighted the need for better identification systems for people as well as improved systems for controlling access to buildings and countries. Another reason for investment in Research and Development in biometric devices is the massive growth in internet-based systems – whether for e-commerce, e-government or internal processes within organizations. Biometric systems (especially fingerprint scanners) are mass-market products at low cost, and can easily be integrated in consumer electronics, like PDA's. Systems using fingerprints, iris, hand scans, and faces are commercially available and routinely used at e.g., airports.

With conventional security systems, users may suffer from socially engineered attacks, as can be seen from the growing number of cases with fraud at ATM-machines. Biometric devices may provide a solution for this kind of crime, but biometric devices still can be 'spoofed.'

Commercial interest in biometric systems has grown rapidly in 2003 and 2004. If we look at the patent applications, the number of applications with the word "biometric" has grown from twenty per year in 2002, to thousands per year in 2003 and 2004. The manufacturers of biometric systems are becoming more aware of the problems with tampering, and solutions are provided how to avoid the possibilities to tamper with their systems. Some patent applications describe ways of detecting if persons are alive and if someone tampers with the systems.

The authors have tested several fingerprint systems and an iris system for possibilities of tampering, and it appeared to be easy if a person allowed to enroll into the system is cooperating. Some biometric features can also be copied without the person knowing that it has been collected (for example fingerprints).

Several other patents and information sources describe the method of computing a template used for the comparison. Depending on the implementation, it may be possible to reverse engineer the template, and try to compute a biometric feature. This way a biometric feature may be 'stolen,' and with it, identity theft may be committed.

It is clear from the above, that most biometric systems are not completely tamper-proof, especially if the equipment is unattended. When investigating evidence from biometric devices, the forensic examiner should consider the possibilities of tampering with the biometric systems, or the possibilities of unauthorized access, before drawing conclusions. If there are suspicions that someone tampers with a biometric system, one should look for e.g. silicon casts of hands or fingers, and examine log files of the biometric access devices. An overview of tampering with these systems shows how to enter biometric systems with photographs of faces, with copies of the fingerprints, with a contact lens for an iris system, or even using a latent fingerprint on the scanner, etc.

From a forensic perspective potentially even more information may be extracted from biometric databases. If the biometric data is stored in a database in a standardized way, it is possible to extract statistical data, and have more information on the uniqueness of biometric features.

Fingerprint, Biometrics, Tampering

D18 Photographic Comparison of a U.S. Army Camouflage Uniform Cap/Uniform, Using the Manufacturing Process, a Sample Study to Include Statistics

Carl R. Krügel, BS, U.S. Army Criminal Investigation Laboratory, 4553 North Second Street, Forest Park, GA 30297*

After attending this presentation, attendees will learn about the photographic identification of the Army Woodland Pattern Camouflage Uniform based on random patterns introduced in the manufacturing process. This presentation will impact the forensic community and/or humanity by sharing the process and data used to compare U.S. Army camouflage uniforms.

This presentation will provide quantitative, scientific, and statistical data that supports the photographic comparison of military uniforms to the scientific community. This study was the base line for Army camouflage uniform photographic comparisons at the U.S. Army Criminal Investigation Laboratory.

Many times civilian subjects wear military camouflage uniforms in the commission of a crime that are subsequently captured on still or video images. From these images, a comparison can be made to the suspects clothing.

The ability to identify individual U.S. Army Camouflage Woodland Pattern Battle Dress Uniform (BDU) caps/uniforms from bank surveillance videos is very valuable. The overall goal is to provide local, state, and federal law enforcement officials with information that supports the comparison process, identification and subsequent examiner testimony.

The case that prompted this study involved a photograph of a soldier in a camouflage uniform and hat taken by a bank security video camera. While the soldier's face was not totally visible, and as such was unidentifiable, the camouflage hat the soldier wore was identifiable. Based on research, it was determined that the hat in question had a distinguishable pattern. After comparison of the submitted Known Hat to the Questioned Hat on the videotape image, the hat was subsequently identified as belonging to the suspect soldier.

In the past, the assumption has been that camouflage uniforms/hats or photos/videos of uniforms/hats from crime scenes could not be used for comparison because the uniforms/hats were considered non-distinguishable or unique. This is due to the fact that military uniforms are manufactured to government specifications with a standard pattern. A study was launched to determine if it could be shown that uniforms/hats bore individual characteristics and were in fact unique.

The study entailed an examination of the uniform manufacturing process. It was observed that individual uniform/hat pieces are randomly cut from large bolts of cloth and randomly sewn together. Even though the pattern is made to military specifications and repeats itself throughout the bolts of cloth, the randomness of the cutting and sewing appeared to create unique points of information. The next step involved conducting a sample study of hats. A total of 57,630 comparisons were conducted from the 340 hats that were examined.

In the final phase, professional statistical assistance was obtained to quantify the results in a reliable manner. The hat was analyzed in four component parts. The results of the study determined that the probability of all four component parts of one hat matching the four component parts of another hat is almost non-existent. As a result, each cap is distinctively individual and unique with the likelihood of an exact duplicate being almost non-existent. This also applied to other items of BDU camouflage clothing such as shirts, pants, and jackets.

This presentation will review the techniques used that can assist examiners conducting clothing comparisons other than camouflage uniforms.

Photographic Comparison, Camouflage Uniform, Manufacturing Process

D19 Counter Terrorism: Training and the Need for Training With a Multi-Agency Approach Using Traditional and Non-Traditional Methods

Gareth W. Roberts, MSc, GWR, 4 Bay Close, Upton, Poole, Dorset BH16 5LR, England*

After attending this presentation, attendees will understand the need to gather trainees and instructional staff from agencies not normally associated with criminal justice training and will understand the importance of practical based training over theory based learning.

The main impact will be on the use of non-traditional training methods, agencies, and equipment supported by novel design of training aids to support realistic training scenarios. This presentation will impact the forensic community and/or humanity by giving the attendee a greater understanding of the complexities of recovering physical evidence from these types of scenes. The attendee will also gain an insight into multi agency training using equipment not normally found in a forensic training environment.

Modern technology has the potential to be used in a training environment to supplement traditional training. However, this paper will demonstrate that by using modern technology coupled with practical scenarios students will have a greater understanding of the stresses involved in working in a counter terrorist related situation. The student would be able to recognize particular sights and smells that are prevalent at counter terrorist related explosions. During this presentation the attendee will gain an understanding of the need to make training as realistic as possible using high quality technological training aids and computing systems to support the training scenario.

The attendee will gain an understanding of the importance of communication at these complicated and complex scenes and the need for the free passage of information unrestricted by departmental bureaucracies. By using methods and equipment normally found in a military environment the attendee will learn that by cooperating with agencies that were previously thought to be unsuitable for collaboration training, better results will be achieved with potential for departmental financial savings and better quality training.

By their very nature, terrorists do not tend to use traditional military tactics when designing an attack. They are not revolutionaries, meaning that it is not unusual for attacks to come from areas that have previously thought to have been deemed as "safe areas." Their cause is often obscure or unknown to the world at large. However, given the current world crisis, known revolutionary groups are now adopting terrorist tactics to give meaning and substance to their cause. If the terrorist operates "outside the box" then so must law enforcement agencies in their intelligence and evidence gathering operations. This cannot be achieved without high quality training that is also provided "outside the box" and well-designed multi agency and technology supported training can achieve this.

Training, Counter Terrorism, Technology

D20 Synergies of Practice: Clinical Forensic Nursing and Quality Management

Mary K. Sullivan, MSN, Department of Veterans Affairs, 4553 East Buist Avenue, Phoenix, AZ 85044; Janet Barber Duval, MSN, 9383 East County Road 500 South, Greensburg, IN 47240*

After attending this presentation, attendees will be able to identify selected factors derived from an analysis of hospital sentinel events that justify a role for the clinical forensic nurse as an adjunct to the quality

management system within a healthcare setting.

This presentation will impact the forensic community and/or humanity by demonstrating research findings which validate that many of the adverse or sentinel events that occur within the hospital setting can often be prevented, recognized more readily and managed more efficiently utilizing the unique perspective and expertise of the clinical forensic nurse. Cost savings will be realized by more timely apprehension and custody of perpetrators, reduced hospital financial liabilities associated with adverse events, and decreased risks to health and safety of hospital patients and workers who may be endangered by offenders.

This poster will present examples of how clinical forensic nursing personnel can directly contribute to the management of forensic cases within the hospital setting. Examples will illustrate the distinct value of nursing actions and thought processes of the clinical forensic nurse who is well indoctrinated within the realms of forensic science and hospital quality management.

Evidence identification, collection and preservation are vitally important to the escalating numbers of forensic investigations inherent within the health care systems. Urgent needs exist in emergency departments, clinics and in-patient areas where nurses are expected to recognize forensic implications within routine patient care scenarios and to possess the expertise to manage and secure the appropriate forensic evidence. The majority of law enforcement and investigative personnel are not trained to navigate a complicated hospital unit, nor do most comprehend the language and social structure within medical facilities. The clinical forensic nurse (CFN) is invaluable, as an interpreter of sentinel event details, serving both law enforcement and hospital administration that must conduct retrospective investigations as a component of their institution's risk management and quality assurance programs. Nurses who are facile in the forensic sciences and who maintain current knowledge of the legal and justice systems are invaluable resources for hospitals and have become the critical link between law enforcement and healthcare facilities.

Veterans Affairs, Office of the Inspector General, designed a feasibility study to determine synergies of practice between clinical quality management and forensic nursing. This study included 1,000 case reviews over an 11 year period of known adverse patient events. Forensic implications emerged prominently including patient abuse or neglect, suicide, assault, homicide, medication delivery system tampering, medication errors, and medical equipment or device tampering. Results showed that utilizing the vital link between forensic nursing and Quality Management may in itself greatly facilitate patient safety and reduce hospital liability. The early recognition of adverse events and prompt insertion of clinical forensic nursing expertise will minimize both time and resources typically expended for the investigation and resolution of these scenarios. In some instances, serial acts of perpetrators will be curtailed, thus saving lives and reducing further sentinel event occurrences.

The CFN, working in synergy with risk managers, performs essential functions to enhance safety within the hospital. The identification of forensic cases, preservation of evidentiary sources, and collaboration with law enforcement are vital elements of the overall investigation and root cause analyses of sentinel events. The CFN makes unique contributions that ultimately improve patient safety as well as the efficiency and effectiveness of quality management initiatives within a healthcare setting.

Synergy, Clinical Forensic Nursing, Quality Management

D21 Field Sampling and Analysis Methods for Arson Investigation

Laura M. Conner, BS, and Kenneth G. Furton, PhD, Florida International University, University Park, Department of Chemistry and Biochemistry, Miami, FL 33199*

After attending this presentation, attendees will be briefed on new methods for sampling from a suspected arson scene.

This presentation will impact the forensic community and/or

humanity by demonstrating new and more efficient methods of sampling will improve analysts' ability to successfully investigate suspected arson cases.

Arson is a serious crime resulting in hundreds of deaths and billions of dollars in property damage per year. Separation of these accelerants from fire debris can be difficult and inefficient. This study examines the performance of a commercially available instrument that uses dynamic headspace concentration to remove possible ignitable liquid residues from debris and store them in an adsorbent filled tube. A pump draws air from a heated debris chamber into the tube. The volatile compounds in the debris will adsorb to the material. The pre-packed tubes contain charcoal or polymer beads as an adsorbent. Use of this instrument in the field potentially eliminates the need to transport large volumes of debris to the laboratory. Traditionally, debris is collected in paint cans and need to be stored until they can be analyzed. Twenty of the tubes used in this instrument can easily be carried in a shirt pocket. Compounds are removed from the adsorbent by solvent desorption and can then be analyzed using gas chromatography/mass spectrometry.

Much interference occurs in arson debris samples. Extraction solvents and background, pyrolysis and combustion products from the material can complicate the process and lead to false positive or negative results. The data analysis methods used are intended to help confirm or exclude the presence of an accelerant in a suspected arson sample, despite these interferences. The spectra are examined for the characteristic patterns of known accelerants. Care must be taken in this process as interfering substances and fire conditions may obscure some of the data.

Samples have been collected and tested to show the efficiency of the portable system both in the presence of a complex debris matrix, such as carpet and padding, and without. Experimental accelerants used include diesel fuel, lighter fluid and a simulated arson mixture. The simulated arson mixture, or SAM, is made up of a range of alkalines and various aromatics encountered in common accelerants. The substances chosen cover the volatility range of common ignitable liquid residues in order to express any inefficiency in the collection range of the portable sampler.

This instrument has demonstrated ability to concentrate small amounts of accelerants spiked onto a matrix. Also, electronic noses are evaluated for their ability to detect the presence of accelerants in specific areas of a scene. These small battery operated instruments give a reading of the amount of VOC's present in air. In this way, they can be used to scan a scene for areas of interest. Accelerant detecting canines can be used for the same purpose. However, canines can be limited in their operating time and ability to work in hazardous scenes. These instruments, while possibly not as accurate as canines, can be inexpensive and do not require a highly skilled operator. The instruments were studied for their abilities to detect various types of compounds. Substances such as diesel fuel, lighter fluid, and a SAM mixture were tested with and without the carpet and padding matrix. Interfering substances can cause difficulties with these types of instruments. However, when used as a preliminary indicator of where to sample, they have shown to be useful.

Arson, Adsorption, Sampling

D22 Proper Storage of Tape Evidence to Prevent Phthalate Interferences

Maureen J. Bradley, PhD, Preston C. Lowe, MS, Diana M. Wright, PhD, and Marc A. LeBeau, MS, FBI, Laboratory Division, 2501 Investigation Parkway, Quantico, VA 22135*

The goal of this presentation is to inform the forensic community about the potential for phthalate migration from vinyl document protectors to the adhesive of tape evidence. Alternative substrates for processing tape evidence will be presented.

This presentation will impact the forensic community and/or humanity by making the forensic community aware of the potential for a false disassociation of two tapes being compared if phthalate plasticized

substrates are used to store tape evidence. Alternative substrates will be presented.

Forensic laboratories are frequently tasked with the examination of tape evidence to establish a possible evidentiary link between a suspect and a particular crime, or between different crimes. Tape associated with the commission of a crime may have been used as a gag or bindings, to seal packages or threatening letters, or in the construction of an improvised explosive device. The sequence of examinations conducted within the laboratory is dictated by the probative value of a given examination and to minimize the potential for loss of valuable evidence. The sequence for tape examinations within the FBI Laboratory is: processing for trace evidence, such as hairs and fibers; processing for latent fingerprints; and finally, physical and chemical comparison or characterization of the tape components.

Tape evidence is routinely submitted as a tangled mass, in strips from ligatures and/or gags, or adhered to various substrates. Historically, when tape evidence was processed for collection of trace evidence or latent fingerprints, it was separated and laid out on vinyl document protectors. This material was convenient, provided a clean surface for the tape to adhere, provided an area to write the item identifiers, and allowed for easy removal of the tape for subsequent examinations. However, upon chemical examination of the adhesives of several tape specimens, it was discovered that the phthalate-based plasticizers used in the vinyl (PVC-based) document protectors migrated into the adhesive. This proved to be problematic when comparing questioned tape specimens, which had been adhered to document protectors, to suspect sources of tape, which had not.

This presentation will demonstrate several case examples where differences were noted in the pyrolysis-GC/MS adhesive data of tape specimens being compared. Different phthalates were detected in the pyrograms of various questioned tape adhesives that were not present in the suspect sources. All other parameters measured for the tape specimens (width, thickness, FTIR of adhesive and backing, and SEM/EDS of adhesives) were comparable. Further examinations revealed that the phthalates present in the adhesives of the questioned tape specimens could be accounted for as a component of the vinyl document protectors the tapes had been adhered to. The migratory nature of phthalate-based plasticizers is well established in literature. Although accounted for, analysis of each vinyl document protector requires additional sample preparation and instrumentation time. Alternative substrates to vinyl document protectors will also be presented.

Tape Evidence, Phthalate Plasticizers, Contamination

D23 A Novel Approach to Searchable Fiber Databases

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After attending this presentation, the forensic science community will learn about a searchable database that will aid in fiber analysis and comparison, as well as provide a training tool to colleges and universities that have a specific focus on trace evidence.

This presentation will impact the forensic community and/or humanity by providing a powerful tool for any crime laboratory or agency that performs routine fiber analysis. Colleges and universities who focus on trace evidence analysis will also find use in the database as an informative teaching aid.

This poster will present the combined efforts of ChemImage Corporation and Microtrace to develop a novel searchable fiber database. This database was designed for the purpose of providing forensic laboratories with a multidimensional program for fiber analysis and

comparison as well as to provide colleges and universities with a complete educational tool. The database contains a multi-tiered searchable spectroscopic database of over 2000 fibers, including digital images, visible absorbance spectra, fluorescence spectra, dispersive Raman spectra and FTIR spectra. Fiber characteristics such as generic class, manufacturer, trade name, color, cross section type, denier, and delustrant are also included as text searchable fields.

The fiber database is unlike any other in that the digital images and the Raman, fluorescence and absorbance spectra were collected using a single instrument platform, the CI TRACE™ Raman Microprobe Chemical Imaging Microscope System (ChemImage Corporation, Pittsburgh, PA). The CI-TRACE™ is designed to apply the combined power of light microscopy, Raman spectroscopy and Chemical Imaging for materials identification and structural characterization. The CI-TRACE™ can acquire brightfield and polarized light microscopic images, as well as dispersive Raman spectra, widefield visible reflectance/absorbance and fluorescence chemical images of samples. The ability to search in a multi-tiered approach depending on the various spectroscopic techniques in addition to optical representation of the fibers searched separates this search method from all existing software.

Through the use of an electro-optic imaging spectrometer, chemical images are recorded as a function of wavelength. Therefore, each pixel in the image has a corresponding spectrum associated with it. An average absorbance or fluorescence spectrum is generated for the fiber by averaging every spectrum associated with every pixel that represents the fiber. This differs from conventional microspectrophotometry methods in that only one dataset is needed to acquire millions of spectra simultaneously, eliminating the need for numerous spectral data collections to encompass the variation along the length of a fiber. This can be done quickly and efficiently, in one step using ChemImage's highly specialized software package. The dispersive Raman spectra are generated by exciting the fiber with a 532 nm, 200mW maximum power laser. The FTIR spectra were collected on a Bruker Vector 33 microscope.

Spectra of the collected fibers can be saved in a variety of spectral formats including .spc file formats; therefore, spectra collected on other types of instruments can be used to search against the database raw spectra. The user also benefits from an easy to use spectral software portion that allows spectral labeling, overlays and report generation.

As a teaching aid for colleges and universities, this database contains tutorials on general fiber examination, while also providing in depth descriptions of optical and polarized light microscopy, as well as Raman, FTIR, visible absorption and fluorescence spectroscopies. A description and tutorial on chemical imaging is also included.

Fibers, Database, Spectroscopy

D24 Novel Uses of Botanical Evidence for Forensic Investigations

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The goal of this presentation is to present unique examples of botanical evidence for use in crime scene investigations so that investigators can learn of the potential opportunities to utilize forensic botany.

This presentation will impact the forensic community and/or humanity by demonstrating additional ways to use botanical evidence in crime scene investigations and generally to make people aware of the unique contributions of forensic botany and its potential.

Awareness of the ways in which plants and plant parts can play in forensic investigations has increased greatly in recent years, and crime

scene investigators are making more use of botanical expertise. However, it is important that more crime scene investigators become aware of the forensic potential of botanical materials. Bock and Norris began studies of plant cells in digestive contents and have demonstrated their usefulness in determining time of death (Bock et al. Identifying Plant Food Cells In Gastric Contents For Use In Forensic Investigations: A Laboratory Manual, U.S. Dept. of Justice; Bock and Norris 1997 "Forensic Botany: An Under-Utilized Resource," *Journal of Forensic Sciences* 42: 364-367). Later, the authors extended their observations to comparison of fresh fecal material associated with a rape-homicide victim and stains on the suspects clothing, again using the presence of specific plant cells associated with distinct food types (Norris and Bock 2000 "Use of Fecal Material to Associate a Suspect with a Crime Scene: Report of Two Cases" *Journal of Forensic Sciences* 45: 184-187; Norris and Bock 2001 "Method for Examination of Fecal Material from a Crime Scene Using Plant Fragments" *Journal of Forensic Investigation* 51: 367-377).

Reported here are some recent uses of forensic botany that extend to other applications. The first case involved plant taxonomy (identification of species by examination of unique features of the plant). Identification of an unusual strain of Bermuda grass (the Almond strain) from the Emerald Bay Golf course on Grand Bahama Island found on a suspect's clothing linked him to the golf course crime scene. Each golf course on the island is characterized by the use of different strains of grass. The second example is the use of diatoms (microscopic unicellular aquatic plants) to compare stomach contents of a drowning victim to different water sources. Each water source has unique diatoms present and typically differs from other nearby sources. The microscopic analysis linked the victim to a different source than where the body was found indicating the victim was partially drowned in the first source (a fountain) and then the child's body was thrown into the second water source where he ingested some additional water before dying. When the child's mother was presented with this evidence, she confessed that she was responsible. A third case is a 30-year-old cold case involving comparison of plant material in fecal material that has been desiccated for many years. Investigators had saved clothing from the victim and the major suspect. Although this case is still under investigation, the authors describe the detailed procedure necessary for preparing such samples for microscopy and comparison of the results.

In addition to these actual investigations, a new method under development based on microscopic analysis of isolated wood cells that may provide a way to identify tiny wood fragments associated with suspects and link them to crime scenes will be reported. Traditional wood identification requires relatively large pieces of intact wood to identify the species of tree from which it arose. However, the question has been asked on occasion if it is possible to identify the small fragments or splinters found in association with a suspect and determine if they might match a larger source found at a crime scene. It was previously assumed this was not possible. Wood largely consists of dead plant cells of several types (fibers, tracheids, vessels, parenchyma). Furthermore, one type of cell (e.g., fibers) may vary in appearance from species to species and in relative abundance. Analyses to date suggest that microscopic characterization of the cell types including careful physical measurements may be a promising approach for dealing with small wood fragments.

Forensic Botany, Microscopic Techniques, Homicide

D25 Assessment of Silicon Polymer Composites for the Extraction of Trace Herbicides: A Tool for Environmental Forensics

*Stephanie K. Bell**; and *Piero Gardinali, PhD, 11200 Southwest 8th Street, Miami, FL 33199*

The objective is to present the use of silicon polymer composites as a new material for passive sampling. This presentation will impact the forensic community and/or humanity by presenting a new material for passive sampling in order to extract trace herbicides from environmental

deployment sites.

Herbicides are found in ground water, freshwater, and saltwater environments and have shown potential for long-range transport throughout sensitive ecosystems. In the U.S. herbicides account for 75% of all pesticides used to control unwanted vegetation. Herbicides found in aquatic environments originate from both agriculture as well as urban landscapes and are easily transported between compartments via water runoff. Due to this, water analysis is the preferred tool to assess their occurrence in the environment. Atrazine and Irgarol are two common types of triazine-based herbicides found in freshwater and saltwater environments respectively. Atrazine is the most commonly used pesticide in the U.S. It is easily detected due to its ability to persist in soil and its water mobility. Atrazine has been found to have environmental effects at levels far lower than that deemed safe by the EPA. Irgarol is an algicide used in formulating antifouling paints for boats and vessels. Irgarol is primarily used to inhibit the growth of copper resistant fouling organisms such as algal slimes and growth of seaweed. It leaches slowly and therefore causes coastal water contamination.

This study introduces the use of silicone polymer composites (PDMS, Fe-PDMS) as a passive sampling media to pre-concentrate analytes found in the environment. Advantages of their usage are based on their capabilities for on-site deployment or through pre-concentration of small volume samples. The composite samplers are assessed for their adsorption/absorption properties by performing lab experiments with the two model compounds, Irgarol 1051 and Atrazine, and by analyzing environmental water samples impacted with the herbicides.

The initial concentration of both Irgarol and Atrazine was 1 ppb. The concentration of the herbicides was monitored by SPME-GC/MS and showed depletion over time. For PDMS, the concentration of Irgarol was reduced by 83.5% after 48 hours of extraction. Water samples containing triple the amount of composites exhibited an increased depletion of the Irgarol concentration with a reduction by 95.5%. Results for Atrazine were similar to that of Irgarol, however the depletion rates were substantially lower. After 48 hours, the PDMS pellets reduced the concentration of Atrazine by only 63.8%. This study was also conducted using magnetic Fe-PDMS composites. Fe-PDMS composites will allow for easy retrieval of the samplers from environmental deployment sites by magnetic filtration. After 24 hours of extraction with the 2:4 Fe-PDMS composite pellets, the concentration of Irgarol and Atrazine were depleted by 49.5% and 55.3% respectively. Mass balance experiments showed that between 60% and 80% of the herbicides could be successfully recovered from the exposed composites by simple solvent extraction with hexane.

This study proved the ability of PDMS and Iron-PDMS as passive samplers for environmental applications. Parameters such as surface area, Fe-PDMS ratios and agitation rates greatly influence the concentration capacities. Application to the environmental samples is already underway. One of the major disadvantages of the approach is the long equilibration times and the structural dependency for heavily functionalized analytes.

PDMS Composites, Passive Sampling, Environmental Forensics

D26 The Comprehensive Masonic CHIP Program (Child Identification): A Comprehensive Forensic Tool

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Learning Objective: To present to the forensic community the comprehensive Masonic CHIP (Child Identification Program) Program, featuring Toothprints®, now operational in 13 states, being implemented in 17 additional states, and approved in 13 additional states, and being considered in Mexico and the 13 Provinces of Canada.

Text: The Masonic CHIP Program is now recognized as the most comprehensive child recovery and identification program in the country, and is hailed by the recovery officials of the National Center for Missing and Exploited Children, as well as law enforcement, dental, forensic, and

prosecution authorities alike.

A child is reported missing every 43 seconds in the United States according to the National Crime Information Center (NCIC) and the National Center for Missing and Exploited Children (NCMEC). Alarming, the NCMEC receives diagnostic photos in only 1 of every 2 missing children's cases! The need for a comprehensive recovery and ID kit readily available is paramount when children are lost, missing, or abducted.

The Masonic CHIP Program provides at no cost to parents:

1. A 3-minute TV-quality videotaped interview with the child
2. Fingerprints
3. A Toothprint® with salivary scent tracer and DNA
4. A DNA cheek swab

The core of the program is TV-quality videotape of the child. Videotape captures mannerisms, expressions, speech patterns, profiles of the child, and gives immediate leads to law enforcement officials tracking missing children. If a picture is worth a thousand words, then a videotape is worth a million; it's easily transportable, can be taken on vacation, or given to grandparents if they become caretakers for any period of time. Videotape can be easily integrated into the AMBER alert system which is now online nationwide. America's Missing Broadcast Emergency Response System (AMBER) can reach millions quickly, and has saved more than 100 children to date. The videotape portion also offers a strong forensic component. Because children are asked to give "their biggest smile" during the interview, the alignment, shape, color, and spacing of teeth can be used to make a positive forensic identification. If skeletal remains need to be identified, a photographic superimposition technique can be used to overlay the videotape onto a skull via use of computers to make a positive forensic identification.

Fingerprints are taken, which are invaluable in tracking lost, missing, or abducted children. Fingerprints are seldom used for identification. They are critical and essential in investigation, tracking and for prosecution purposes.

The third component of the program is Toothprints®. It adds a very strong recovery and forensic aspect to this program. A Toothprint® records individual tooth characteristics, tooth position within the arch, upper and lower teeth relationships, gum contour and anatomy, as well as marginal outlines of individual restorations and dental sealants. Every Toothprint® is unique, even identical twins can be easily differentiated by their Toothprints®. Seventy (70%) percent of American children are now cavity-free and filling-free and thus have literally blank dental records reported to the NCIC when lost or missing.

Saliva on the Toothprint® wafer serves as a DNA sample for at least 3 years, but more importantly, serves as a scent tracer for recovery bloodhound dogs which can easily track saliva scent/skin cell scent. Bloodhounds typically track individual skin cells falling from humans at a rate of 100 cells/minute. Bloodhounds can distinguish even identical twins apart by smelling their scent. Children are taught to leave a "spit trail" if lost in the woods; or if age appropriate, leave their saliva, fingerprints, and hair behind if abducted. Recovery, identification, and prosecution gain much with such evidence.

The fourth component of the program is the DNA cheek swab which will provide DNA material for both mitochondrial and nuclear DNA matching for more than 20 years when properly frozen in a home freezer.

Last October, the American Dental Association passed a Resolution asking all State Dental Associations to join with community child ID programs on a complimentary basis to keep American children safe. To date, the Masonic CHIP Program has ID'ed more than 192,000 children in the Commonwealth of Massachusetts; and 43 Public School systems have adopted the program for all students grades K – 12. Last year 258 CHIP events were conducted in 142 communities in the Commonwealth. The program is free; the organizers keep no ID records - all ID materials are given to the parents. Parents can elect to participate in any of the four components of the program. Children from birth to college-age may participate.

CHIP offers maximum peace of mind for parents, community leaders,

and the children themselves, while giving comprehensive materials to rescuers and forensic scientists.

Masonic CHIP Program, Toothprints®, Child Identification D27 Debunking a 'Snuff Film' by Locating Its Source

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After attending this presentation, attendees will be briefed on an approach to systematically searching the web and digital databases to determine the provenance of digital data.

The examination of web-derived content is increasingly common in the evaluation of digital evidence. This presentation will impact the forensic community and/or humanity by providing one example of a systematic approach to determining the provenance of such data.

Hypothesis: There are multiple facets to the examination of image and video data; often examination of the content of the data is sufficient, but determination of the provenance may be of equal importance.

Methods: A putative snuff film was presented to a medical examiner office, and an evaluation was requested to determine if further investigation was required. Examination of the content of the video was performed which demonstrated it to be contrived. In addition, the provenance of the video was in question. It was suspected that this was downloaded from the web. To answer this question, a structured search strategy was developed and employed; involving conventional search engines, commercial and open databases, and automated agents (often called "spiders" or "avatars"). The examination of content was presented in a paper in a previous AAFS meeting. This presentation concentrates on search strategies and evaluation of provenance separate from examination of the video or metadata itself.

In order to evaluate the provenance of such a video, it is necessary to examine web sites devoted to this kind of imagery. Numerous discussion groups exist in which these videos are critically discussed by aficionados, many of whom are as critical of content as are experts in content analysis. Chat rooms exist on the internet in which these videos are a topic of discussion. Multiple versions of the same video may be present. In cases where the video is old, it may be that the data has been removed from the net, and it is necessary to locate and search archives of deleted web pages. In some cases, these videos may have been discussed in the news or other non-web media, in which case a search of media databases may be appropriate.

Results: The search revealed multiple discussions of the video in question, including an interview with the producer, the location of the film company that produced the video, the date the video was produced, the motivation of the video, and previous forensic evaluations of the video. The search also provided other examples of both contrived snuff film and examples of footage of real killings. One of the videos downloaded by an intelligent agent during this search was in turn later submitted for evaluation by another agency as yet another possible homicide. In this latter case, the video was real footage of a real homicide, taken in Chechnya. Thus, a single comprehensive search, if the data is appropriately archived locally, may provide a shortcut for later cases.

Impact: Putative snuff films and related imagery are not only more numerous, but also more widespread than ever before. They occasionally cause consternation to local law enforcement when they are perceived as possible real footage. This is particularly true when real footage is integrated into the contrived video. Examination of the video itself, metadata, and searching for the provenance of the data provides different data, each of which may be useful in the investigation.

Snuff Film, Digital Video, Image Analysis

D28 A Presentation of JLab: Restoring Selected Examples of Corrupt JPEG Data

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The goal of this presentation is to impart knowledge of a tool for the analysis of JPEG files and the restoration of corrupt JPEG data. Development of the JPEG toolbox named JLab was commissioned by Bundeskriminalamt, Germany, and it is distributed free of charge for police purposes.

This presentation will impact the forensic community and/or humanity by demonstrating that in special cases, the use of JLab will make it possible to recover pictorial evidence from digital data with little work, which before JLab was nearly impossible or would have required a great deal of effort.

Corrupted JPEG files that originated from investigative proceedings and reached the image enhancement service of the German Bundeskriminalamt (BKA) caused the BKA to commission the development of a software tool for the analysis and restoration of partially damaged JPEG files. This tool called JLab is now available for forensic applications. During this presentation the functionality and features, the structure, the input, and output, and the restrictions of JLab will be exemplified by means of selected sample images.

At the moment JLab's analysis and reconstruction capabilities are limited to JPEG/JFIF files (JPEG File Interchange Format) with DCT (Discrete Cosine Transform) and Huffman coding for practical reasons. This type of compression is by far the most commonly used at present. The program runs on computers with the MS Windows operating system. JLab combines the "viewer" and the "hexeditor" functions. In four sub-windows it displays three views of a JPEG data stream: a structural view, a hexadecimal view with a simultaneous ASCII interpretation, an image view and an additional preview which is especially useful while modifying large images. The views are linked together so that one can perform a combined analysis and/or restoration of structural elements and image areas.

The program can handle several JPEG data streams in a single file, e.g., a large JPEG image with a small JPEG thumbnail included, like those for instance, which Adobe® Photoshop® produces. Since JLab provides a detailed representation of the complete JPEG structure, one might be able to draw conclusions about the history of the image from both the comments and those inputs, normally not displayed, that are specific to applications involved before. Even if other viewers do not accept a JPEG file, JLab can recognize whether it contains any structures, which conform to JPEG and, at the least, can display the contents in the hexadecimal and ASCII formats.

The quantization tables and the Huffman tables are among the most important parameters of the compression procedure. Instead of faulty or missing tables, standard tables and tables from correct sample files may be used. Databases from different tables can easily be created and extended. Tables that are currently being analyzed can be compared with those from the database on the basis of a brief characterization, so that similar tables can be found quickly. The manual repair of tables and the restoration of damaged marker data require an exact knowledge of the JPEG standard.

The underlying principles and the handling of JLab will be discussed in detail during a live presentation showing examples from two categories:

- JPEG test images with artificially generated defects
- Damaged JPEG images from actual police investigations.

Restrictions preventing JLab from a successful restoration normally turn out to be due to extensively corrupted data like the lack of major parts of the Huffman table, the availability of only very small data fragments or some classes of errors that generally apply to the entire image data.

The outlook will give a statement about the possible future of JLab

and present ideas about other developments, e.g. concerning the JPEG2000 standard.

JPEG Images, Data Corruption, Image Data Analysis and Restoration

D29 Analysis and Visualization of Defective Digital Image Data

Stefan W. Ott, Bundeskriminalamt, KI 22, Wiesbaden, Hessen D-65173, Germany*

After attending this presentation, attendees will understand how to deal with digital image data, which are rejected, misinterpreted, or shown incompletely by standard image viewers, with emphasis on the JPEG file format.

This presentation will impact the forensic community and/or humanity by demonstrating the use of advanced tools for image data analysis and restoration, and how this extends the capabilities of forensic examinations to cases where no other method has a chance to recover the original visual information. This represents an important advantage in areas where image information is crucial for evidence and the risk of trying to destroy the data is high, e.g. in child pornography.

The introduction will sum up the main limitations of standard image viewers, give some typical reasons for the appearance of defective image files, and emphasize the importance of the JPEG standard. Some examples of visualizations of defective image files produced by standard viewers, compared with the results of thorough analysis and restoration, will be used to illustrate the potential gain.

An overview of useful tools will be given, including hex editors, graphic file format descriptions and analyzer tools, reconstruction software for image memory cards, scanner for image file signatures, image processing software with import functions for raw format, and so on. The capabilities and limitations of the different tools will be described and the missing functionality will be derived from a list of requested features.

Examples like AVIs with MJPEG, video surveillance data and fragments of JPEG streams, will illustrate the methods to identify and process case data where only moderate knowledge is required for successful recovery and restoration such as a single obvious wrong parameter in the file header or a false file extension. Additionally, these examples will demonstrate how hopeless cases, e.g. those where strong cryptography is involved, only small fragments are available or compressed data has been badly corrupted are recovered.

A relatively detailed examination of the structure of a JPEG stream, the important elements and their role in the decoding process will lay the foundation for a successful application of the JPEG toolkit JLab. For details the audience will be referred to the literature. Examples are demonstrated with screenshots of JLab-Sessions. The distribution policy of JLab will be explained and the use of JLab will be encouraged. A live demonstration with JLab will be given by Bernd Rieger in his contribution "A Presentation of JLab: Restoring Selected Examples of Corrupt JPEG Data."

The problem of evidential proof will be discussed. The goal of the operation is not the perfect reconstruction but the correct visualization of the available image data. The conclusion will show that a perfect solution will never exist, describe the current state-of-the-art in image data analysis, and the plans for the further development of image data analysis tools.

Image File Analysis, Defective Image Files, Image File Restoration

D30 Analysis of an Image Anomaly in the Space Shuttle Columbia Accident, Part 1: Authenticating the Camera Source

Richard W. Vorder Bruegge, PhD, FBI, Forensic Audio, Video and Image Analysis Unit, Building 27958A, Quantico, VA 22135; and*

After attending this presentation, attendees will understand one means used to authenticate a digital camera as the source of a specific digital image.

This presentation will impact the forensic community and/or humanity by demonstrating to the forensic community one of the many ways forensic scientists are conducting analyses of digital evidence, and will see how forensic image analysis is a field with a broad application.

The presentation will describe the analyses used to confirm that five (5) digital images depicting the Space Shuttle Columbia (STS-107) during its atmospheric reentry on February 1, 2003 were taken with a specific camera. One of the digital images examined in this case included an anomalous feature some thought might be related to the accident, either as a cause of the accident, or as documenting the breakup of the shuttle. A description of the analysis used to determine the source of that anomaly is included in a separate presentation (“Part 2”).

On February 1, 2003, the Space Shuttle Columbia (STS-107) was scheduled to return to Earth after an extended stay in orbit. The flight path of the shuttle would span the entire width of the contiguous United States early in the morning, with a path that began in northern California, across the western U.S. to Texas, and then across the southern U.S. before a landing in Florida. Tragically, seven lives were lost as Columbia broke up over Texas.

Although the cause of the accident was ultimately identified as due to a debris strike on the left wing of the shuttle during the ascent phase after launch, in the early weeks after the accident the true cause was unknown and multiple avenues of investigation were pursued. One such avenue included the analysis of a digital photograph taken during the reentry by one of the authors (Goldie), which depicted an anomalous feature extending from (or toward) the path of Columbia as it crossed over northern California. After receiving a description of the image from the author, NASA dispatched a former shuttle astronaut to take possession of the digital camera and flash card on which the images had been captured, as well as a compact disk containing the images downloaded from the flash card. These items then were delivered to the FBI for the purpose of (1) authenticating the image as having originated from the specific camera and (2) analysis to determine the source of the anomaly, if possible.

The image authentication consisted of multiple parts. First, the files contained on the flash card were downloaded and compared to the image files contained on the compact disk to verify that the images were exact copies of one another, differing only in file names. Next, metadata associated with each image file was examined to determine if it was consistent with the questioned camera (NIKON COOLPIX Model 880), as well as with the exposure and focal length settings expected for the images in question. Likewise, the image size (in pixels) and output type (JPEG) were verified as being consistent with the questioned camera. It was likewise observed that the five Columbia images were originally assigned sequential file names when recorded on the flash card. Goldie reported that no subsequent images were acquired on the camera following the re-entry images, and test images captured in the laboratory using the questioned camera were found to be sequential, and continuous with the Columbia images. All of these factors were found to be consistent with an origin in the questioned camera.

Finally, an analysis of the anomalous image itself was conducted to identify artifacts consistent with malfunctioning detectors (“bad pixels”) within the camera’s CCD chip. A total of fifteen (15) such artifacts were identified in this analysis. All of these artifacts were likewise observed in the other four images of Columbia captured on February 1. Test images recorded with the questioned camera were found to contain all of the “bad pixels” seen in the February 1 images. For images the size of the Columbia images, the chance that any two images could share all fifteen anomalies at the same pixel locations through random chance was calculated to be less than one chance in 10-to-the-97th power.

A further examination was conducted to depict the presence of

artifacts, which might indicate that the “anomalous” image was the product of intentional image manipulation. No such artifacts were observed, therefore it was determined that the Columbia images were authentic images recorded using the questioned camera.

Image Analysis, Image Authentication, Pixel Defects

D31 Analysis of an Image Anomaly in the Space Shuttle Columbia Accident, Part 2: Determining the Source

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After attending this presentation, the forensic community will understand the procedures used to assess anomalies in images and learn something about photogrammetry.

This presentation will impact the forensic community and/or humanity by providing the forensic community with a better understanding of the importance of imaging, image processing, and photogrammetry. The ability to utilize images in forensics will be further underscored.

The presentation will describe the analyses used to assess the source of an anomaly contained within an image depicting the Space Shuttle Columbia (STS-107) during its atmospheric reentry on February 1, 2003. This anomalous feature was thought to be related to the accident, either as the initiating cause of the accident, or as a real effect documenting the breakup of the shuttle. A description of the analysis used to authenticate the image as having originated with a specific camera is included in a separate presentation (“Part 1”).

On February 1, 2003, the Space Shuttle Columbia (STS-107) returned to Earth along a flight path that crossed northern California prior to an intended landing in Florida. Tragically, seven lives were lost as Columbia broke up over Texas.

Although the cause of the accident was ultimately attributed to a debris strike during launch, immediately after the accident the true cause was unknown and multiple avenues of investigation were pursued. One such avenue included the analysis of digital photographs taken during the reentry by one of the authors (Goldie). One of these photos depicted an anomalous feature extending from the path of Columbia as it crossed over northern California.

The photographs had been taken using a NIKON COOLPIX 880 mounted on a lightweight, but professional grade, tripod. The weather conditions were partly cloudy, low level clouds below 500m with occasional gusts up to 20 kmph. The photographs were taken between 5:52-5:54 a.m. PDT, with an exposure time of 8 seconds each.

The resolution of the images is insufficient to make out any details of the shuttle itself. Instead, the photographs depict the plasma “plume” created by Columbia as it heated and ionized the upper atmosphere at approximately 70 km altitude. This plume would appear brightest at the leading point of Columbia’s passage, and would fade to extinction after 1-2 minutes. Therefore, in a long exposure photograph, one can divide the plume into three primary components: (1) The plume which already existed within the camera field of view at the beginning of the exposure and which would continue to fade during the exposure; (2) a bright point light-source traversing the scene during the exposure (representing the transit of the shuttle across the frame); and (3) superimposition of the residual plume with the initiating hot-point source, as a result of camera or spacecraft motion. Recognition of these three components is critical to the ultimate analysis in this case.

The FBI was asked to examine this photo and provide an assessment of the anomaly and its possible origin. In addition, NASA simultaneously sought advice from other facilities and experts, including experts knowledgeable in upper atmospheric physics, to assess potential natural

causes.

The examination of the anomaly consisted of several parts. First the characteristics of the anomalous image and the anomaly itself were catalogued and described. These include the size, shape, luminance, and color characteristics of the anomaly and plume of plasma left behind Columbia as it crossed the field of view. The characteristics of multiple stars in the background were also catalogued in this step. A variety of image processing techniques such as brightness and contrast adjustments, unsharp mask, image rotation, and uni-directional image resizing (“vertical exaggeration”) were used to improve the visibility of features within the image. When examined in this manner, it became apparent that the image anomaly displayed a sinusoidal pattern.

A photogrammetric analysis was conducted to calculate the size of the anomaly in both image space (at the camera’s focal plane) and object space (at the position of the shuttle). Finally, the characteristics of the anomalous image were compared with the other images of Columbia’s reentry taken immediately before and after this image using the same camera.

Once all of these observations and measurements had been taken, it became apparent that no outside source needed to be invoked for the anomaly. In addition, the special panel convened by NASA was unable to find corroborative evidence to support the alternative theories (high altitude lightning/ geomagnetic storm, triboelectric spacecraft charging, seismic motion). The simplest explanation for the anomaly was that it represented the product of camera vibration. Limited tests conducted in the laboratory demonstrated that primary features of the anomaly could be recreated.

Image Analysis, Photogrammetry, Digital Image Processing

D32 Progress Report on the Study of Photographic Technology Used to Document Footwear Impressions

Herbert L. Blitzer, AB, MBA, and Jack L. Jacobia*, Institute for Forensic Imaging, 338 South Arlington Avenue, Suite 111, Indianapolis, IN 46219*

After attending this presentation, attendees will understand the issues involved in photodocumentation of footwear impressions and preliminary indications regarding the ability of digital photography to render suitable images.

This presentation will impact the forensic community and/or humanity by helping the impending transition from traditional silver halide to digital photography.

As digital photography grows and the availability of traditional silver halide film subsides, the question of the technology used to photograph footwear impressions becomes more and more important. This study will examine the effect that photographic technology has on the examiners’ ability to evaluate footwear impressions from photographs.

Recently digital cameras have come on the market that are purported to be, “as good as film,” and while this is primarily advertising hype, practical experience as well as laboratory testing have shown that they are indeed quite good. In addition, printer technology is now available that should be able to render images adequate to the task of at least most footwear examinations. They have very subdued dot patterning, high resolution, and sufficient print size for the application. They are also priced within the range of most forensic laboratory budgets. At the same time as these new products have come on the market, film industry sources indicate that film sales down some 20% in each of the past two years.

The same test impressions will be photographed using four cameras: 35 mm film, 120 film, 6 mega pixel digital, and 12 mega pixel digital. All film prints will be made using traditional film printing and photographic paper. The digital prints will be made using modified silver halide photography (FUJIFILM Pictography 4000 printer) and an inkjet printer modified for increased resolution but restricted to black and white only. Exemplar photos will all be made using medium format film photography.

Questions will be included to allow stratification of the sample based upon the experience levels of the respondents. Samples will be sent to approximately 100 examiners, each receiving a half replicate. Results will be evaluated using traditional statistical techniques. The results of a limited-sample pretest will be shown.

In preparation of this test a number of experts in the field of footwear examinations have been consulted to establish the tasks that respondents will be asked to perform. The responses will require the use of a Likert scale, and a five-point scale has been developed which should help reduce the standard deviation of the responses and not compromise validity. The experts also helped to assure that the approach to creation of the test samples is representative of the more stringent requirements that examiners encounter. Quality management experts from the U.S. Navy have assisted with the design of the experiment and will assist with the analysis of the data.

Footwear, Digital, Photography

D33 Crosscorrelation-Based Pulse Suppression for Forensic Audio Analysis

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After attending this presentation, attendees will learn about a new method for improving audio, specifically how to increase the clarity of audio signals affected by a class of interference consisting of repeated pulses.

This presentation will impact the forensic community and/or humanity by informing the community about forensic audio analysis and different methods for improving the clarity of speech in law enforcement recordings.

A goal of forensic audio enhancement is to combat additive background interferences in a desired signal to assist in forensic analysis and presentation in legal cases. In this presentation, the authors introduce a new software-based approach that runs on a personal computer to enhance speech. This software increases the clarity of audio signals affected by a class of interference consisting of repeated pulses. Algorithm is based on pulse detection through crosscorrelation with a prototype pulse followed by pulse scaling or subtraction.

Surveillance recordings in law enforcement are typically made using a variety of equipment. The proliferation of cell phones has carried over into the law enforcement arena and subsequently a large percentage of surveillance recordings involve cell phones. Interference between recording equipment and the transmitters in cell phones creates noise. This noise is often heard as a pulsing similar to that from a lawn sprinkler and thus is often referred to as “sprinkler pulses.” This pulsing gets recorded along with the speech and seriously diminishes speech intelligibility and increases listener fatigue. Removing this particular class of pulses without damaging the speech is the subject of this presentation.

Most current algorithms for removing impulse-type noise require very short duration pulses, typically a few milliseconds, are susceptible to random wideband noise, and result in holes in the time waveform. Standard algorithms also require that the pulses be largely deterministic in nature. The authors have developed a technique to detect and suppress sprinkler pulses, which are, on the other hand, typically relatively long in duration and contain a random component. These pulses have a characteristic signature, being low frequency and deterministic at the beginning and end of the pulse but wideband and random in their mid-region. The low frequency component at pulse edges is consistent enough from one pulse to the next so that a matched filter can be used as a detector. The authors’ new approach allows sprinkler pulse durations on the order of 20 ms, is robust, and avoids temporal holes. The method also provides the audio analyst with easily adjustable parameters for a detection threshold,

suppression pulse duration, and suppression level.

The steps in the pulse suppression algorithm are as follows:

1. Select initial prototype pulse
2. Crosscorrelate and detect pulses
3. Refine prototype pulse by averaging detected pulses
4. Crosscorrelate and attenuate pulse over pulse duration
5. Adjust detection threshold interactively

Pulses that change over time are also allowed by performing a time-varying average in Step 3. The most effective means of removing the pulses is to apply pulse scaling after detection. First, pulses are detected and then suppressed. Therefore, suppression occurs only during pulses but speech during pulses is also suppressed. To counteract the speech suppression, perceptual continuity is exploited to improve intelligibility. Application of the algorithm to real-world signals results in significant noise suppression and improved word perception. Due to the presence of a random pulse component, less successful results using a pulse subtraction method where a prototype pulse is subtracted has been observed.

Future work in this area may include examining the possibility of reconstructing the speech lost when a pulse is suppressed. The pulse duration is short enough that in most cases it should be reasonable to perform such a reconstruction. Another possibility is the use of a multiband pulse-suppression scheme.

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Digital Evidence, Audio Enhancement, Speech Processing

D34 Science and Mathematics Education for Crime Scene Technicians and Crime Scene Reconstructionists

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The goal of this presentation is to initiate a discussion of the minimum educational qualifications in mathematics and natural science that should be required of crime scene technicians and crime scene reconstructionists. After this presentation, attendees will have a better idea of the minimum educational standards in mathematics and natural science that crime scene technicians and crime scene reconstructionists should have.

This presentation will impact the forensic community and/or humanity by promoting the discussion of the educational qualifications of crime scene technicians and crime scene reconstructionists, an area of concern that has yet to be explicitly addressed by technical working groups or professional societies.

Over the last few years technical working groups (TWGs) and scientific working groups (SWG) in a number of forensic science disciplines have established minimum educational qualifications for practitioners of these disciplines. Some consideration should also be given to the educational qualifications of crime scene technicians and crime scene reconstructionists. What minimal levels of competence in mathematics, physics, chemistry, and biology should persons employed in these roles have attained, either in high school or college? The answers to these questions would be useful for high school and college guidance counselors and for high schools and colleges creating courses in crime scene processing and crime scene reconstruction. The International Association for Identification (IAI) has published guidelines for a three-level certification of crime scene technicians/analysts. Crime scene technicians

(level I) are expected to have completed a minimum of two crime scene related courses; crime scene analysts (level II) are expected to have completed a minimum of four crime scene related courses; and senior crime scene analysts (level IIIB) are expected to have completed a minimum of six crime scene related courses. The IAI requirements do not address the issue of the minimal mathematics and natural science knowledge that crime scene technicians or crime scene analysts require to perform their basic functions.

Crime scene processing requires meticulous documentation of the scene of a crime through note taking, sketching, and photography. Rigorous laboratory course work in natural science is a useful introduction to disciplined note taking. A course in physical optics is a useful introduction to photographic optics. An introductory chemistry course provides an adequate basis for understanding the chemistry of crime scene processing (such as latent fingerprint development and tire and shoe impression enhancement), while an introductory biology course provides an adequate basis for understanding the handling of biological evidence (such as blood and other body fluids).

Crime scene reconstruction requires a somewhat different set of skills than crime scene processing. Texts on bloodstain pattern analysis and shooting incidents require a grasp of basic algebra, basic geometry, and basic trigonometry. Calculus (although it is the basis of classical kinematics) is not required. Nor are matrices and vectors required. Mastery of the deductive reasoning process used in mathematical proofs also has considerable value for crime scene reconstructionists. The most important scientific discipline for crime scene reconstructionists is physics. Traffic accident reconstruction, bloodstain pattern analysis and shooting reconstruction all require a thorough grounding in classical physics. One of the authors (E.R.) has worked with the Department of Physics of The George Washington University to create an undergraduate forensic physics course. This course would cover topics relevant to crime scene reconstruction: basic kinematics (including conservation of linear and angular momentum, coefficient of friction, projectile trajectories), fluid dynamics, electromagnetism, physical optics, and molecular physics.

Archaeology has great potential value for both crime scene technicians and reconstructionists. Crime scene technicians collect physical evidence, while archaeologists collect material culture remains. Crime scene reconstructionists reconstruct events that occurred over a short time span, while archaeologists reconstruct events that occurred over years, centuries, or millennia. Archaeologists approach the documentation of their sites in much the same way as crime technicians and crime scene reconstructionists approach the documentation of crime scenes. Most colleges and universities have Departments of Anthropology that offer introductory and advanced coursework in archeology. They also offer archaeology fieldwork courses. In Great Britain some universities have degree programs in forensic archaeology or offer forensic archaeology concentrations. Many Departments of Anthropology also offer courses in physical anthropology with laboratory work in human osteology.

The Information Technology Age has affected crime scene investigation and crime scene reconstruction. Computer-assisted design (CAD) crime scene/accident scene diagramming programs are increasingly being used by law enforcement agencies, after precise measurements have been acquired by sophisticated tools like Total Station or photogrammetry techniques using a perspective grid and reverse projection. Computer generated simulations/animations and reconstructions are frequently used in court as demonstrative visual aids for the jury. Digital imaging, with the possibility of enhancing marginal images with Photoshop® and similar software programs, may end the use of traditional film cameras. As a consequence of these developments, crime scene technicians and crime scene reconstructionists should have significant course work in digital photography and computer-assisted design.

Crime Scene Technician, Crime Scene Reconstruction, Education

D35 An Equivocal Death Investigation With Staged Crime Scene: Death Classified

as Undetermined Manner

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The goal of this presentation is to present to the members of the forensic community the complications involved in an equivocal death investigation and the significance of the medicolegal findings in the police investigation. Why it is essential that police, prosecutor's and medical examiners work as a team.

This presentation will impact the forensic community and/or humanity by illustrating an alleged hanging and how the crime scene and medical evidence coupled with the victimology and inconsistent statements of the parents refutes any suicide theory. The audience should appreciate the importance and significance of the medical examiner, the police, and prosecution working as a team to reveal the truth and see that justice is done for the deceased.

Equivocal death investigations are those inquiries that are open to interpretation. There may be two or more meanings and the case may present as homicide, suicide, or accidental death. The facts may be purposefully vague or misleading as in the case of the "Staged Crime Scene."

In this case, an 11-year-old female was found hanging in her bedroom from a bedpost by means of a thick rusty metal chain, which had been wrapped several times around the top of the bedpost and connected to a blue colored metal hasp (described as a carabineer) that was connected by an "S" hook to a red colored leather dog collar, which was around the neck of the victim. The victim was fully clothed and was wearing eyeglasses perched on the end of her nose.

The police investigated the case as a suicide. Many of the parents' statements were inconsistent and revealed discrepancies in the chronology of the event. The father of the victim was eventually asked to take a polygraph test.

The medical examiner advised the authorities that medical examination of the child revealed sexual trauma to both the vagina and the anus of the 11-year-old consistent with penetration. The Medical Examiner also felt the death was suspicious for homicide.

The police questioned the father, who had failed the polygraph test. He eventually confessed to sexually assaulting his daughter but denied that he killed her. Police and Prosecution authorities believed that the victim had committed suicide because of his actions. The prosecutor's office advised the medical examiner that the case should be ruled a suicide, which was consistent with their prosecution theory.

The medical examiner refused to label the death a suicide and requested outside review of the findings. Three out of four consultants agreed with the medical examiner that the case was more consistent with homicide than suicide. The presenter concluded that the scene had been "staged" to make the death appear to be a suicide. This conclusion was based on the contradictory and inconsistent statements of the parents, the family history, the suspect's inappropriate past behavior, the victimology, which was not consistent with suicide, the intricate configuration of the ligature, and the incomplete police investigation. The medical examiner ruled the death Undetermined Manner.

The importance of the evaluation of victimology in determining the factors in an Equivocal Death Investigations as well as the importance of comparing autopsy findings with police investigation and the reconstruction of the crime scene are indicated.

Equivocal Death, Staged Crime Scene, Undetermined Manner

D36 The Police Detective in the United States: A Retrospective and Prospective Analysis of Crime Detection and Criminal Investigation

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Attendees will learn what the best research and literature reveals about the historical development of the role and activities of detectives in U.S. police agencies. How that role and those activities have changed over time, and what the future holds for detective work in the light of changes in policing and the forensic sciences, will be discussed. The challenge of "new" crimes and new approaches to detectives' investigative modes will provide the participant with a historically grounded perspective with which to consider the direction of detective work.

This presentation will impact the forensic community and/or humanity by providing perspective on the use, value, and role of forensic evidence as those have evolved over time in the work of police detectives.

As the historian Marc Bloch has pointed out, "Misunderstanding of the present is the inevitable consequence of ignorance of the past." Or, as expressed in different words by Eddie in the movie, *Barbershop* – "You can't get respect unless you know your history."

It is within this context that the history and the role of the police detective is examined in society. Detectives of today essentially "get no respect," partially because of the misconceptions that prevail about them in the media, in society, and, indeed, even amongst police officers themselves. By focusing on the historical development of the police detective, a better understanding of their current role is gained and, more importantly, the ability to chart a course for the future of the detective and the police criminal investigation process.

In this paper the authors address four fundamental questions. The first is: "Where Are We Today?" In response, a brief overview of crime, the agencies responsible for investigations, and the current role of detectives are given. The second question, "How Did We Get Here?" is answered by reviewing pertinent literature and research assessments regarding the changes over time in the detective's role; the authors combine this account with material drawn from the policing, forensic science, and fictional detective literature. The third question: "Where Are We Going?" is answered by an examination of what is really known about the current situation extrapolated to where detective work seems to be headed. The fourth question, perhaps the most important, is: "Where Do We Want to Go?" Here, the authors draw upon lessons learned from the history of detective work to project what will be necessary in order to deal more effectively with the crime-related investigative challenges of the future.

In addressing the issues of interest most criminal behavior is conceptualized as a process consisting of a continuum of five temporal phases. There is first a crime Planning phase. This is followed by an Action phase, the time in which the crime is committed. After the Action phase, there is an Escape phase, during which the offender leaves the scene of the crime. The offender then enters a Fugitive phase, the time period between crime commission and when the offender is apprehended or the statute of limitation for the crime expires. Additionally, in many types of crime, there is a Disposal phase, in which the offender disposes of the fruits of the crime (i.e., sells stolen property, consumes illegally purchased drugs, etc.).

The conceptual framework of the crime continuum model can be expanded for different types of crime by describing each phase of an offender's activities in terms of time (the amount of time an offender may spend in each phase for various types of crimes) and space (types of spatial areas such as a home, neighborhood, or workplace in which the offender may spend time). Additionally, the various sources of crime information (people and things) that might be available within the time frames and spatial areas of each crime phase can be inferred. Because it is information and its availability, quality and susceptibility to useful processing that is, at core, the driving mechanism for investigative activity, the stages of the conceptual model permit an examination of future prospects.

The presentation is closed with an overview of "new" challenges for the detective. An example is costly and socially devastating "political" crime, such as espionage and terrorism. Reactive bureaucracies will be

forced to expand investigative goals and activities to include prevention and detection of crime, aside from merely reacting to it. Although detectives will always be expected to respond to reported crimes, their style and efforts will have to be expanded and enhanced in order to include proactive seeking of information, in both overt and covert ways. In many ways, this change is a completion of a circle from the present to the past in the world of the detective.

Detectives, Policing, Criminal Investigation

D37 The Rarity of Unusual Dispositions of Victim Bodies: Staging and Posing

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After attending this presentation, attendees will understand the various positions in which killers leave victim bodies and the reasons why they leave them that way.

This presentation will impact the forensic community and/or humanity by identifying the rarity of the unusual dispositions of victim bodies by killers and assisting forensic scientists recognizing an unusual body disposition when they come across it. This is especially important in staging cases, because when staging is not recognized, it will lead the investigation in the wrong manner.

The act of leaving a victim's body in an unusual position is a conscious criminal action by an offender to thwart an investigation, shock the finder and investigators of the crime scene, or give perverted pleasure to the killer. The unusual position concepts of posing and staging a murder victim has been documented thoroughly and have been accepted by the courts as a definable phenomenon. One staging case and one posing case are outlined to reveal characteristics of those homicides. From the Washington State Attorney General's Homicide Investigation and Tracking System's database on murder covering the years 1981-2000 (a total of 5,224 cases), the relative frequency of unusual body dispositions is revealed as a very rare occurrence. Only 1.3% of victims are left in an unusual position, with .3% being posed and .1% being staged. The characteristics of these types of murders also set them apart. Compared to all other murders, in staged murders the victims and killers are, on average, older. All victims and offenders in the staged murders are white, with victims being disproportionately white in murders with any kind of unusual body disposition. Likewise, females stand out as victims when the body is posed, staged, or left in other unusual positions. Whereas posed bodies are more likely to include sexual assault. Often in serial murders, there is no evidence of either in the staged cases. Last, when a body is left in an unusual position, binding is more likely, as well as the use of more "hands on" means of killing the victim, such as stabbing or cutting weapons, bludgeons, ligatures, or hands and feet.

Staging, Posing, Murder

D38 Wrapping a Carcass in a Sheet - The Influence on Insect Succession During Summer and Winter in Central South Africa

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After attending this presentation, attendees will understand the importance of a possible delay in insect succession due to the presence of a sheet in the colder months of the year.

Forensic entomology is a relatively new field in South Africa. The

authors are members of the only research group active in crime scene analysis and field research to that effect. Unfortunately with the high level of violent crime in the country, any information and support in the solving of these crimes is urgently and desperately needed. As most of the forensic entomological applications are often associated with the poorer impoverished section of the population, the need is even greater. As the only way to expand research is through international support, attendance at this congress may allow the authors work to become known, and support offered even if it is only simple information exchange.

This presentation will impact the forensic community and/or humanity by expanding the support to other researchers in the field.

A homicide case, south of Bloemfontein, in central South Africa during 2002, lead to the question of the influence the wrapping of a body has on insect succession. Using pig carcasses, experimental trials were designed and conducted in four consecutive seasons at the experimental site on the western campus of the University of the Free State, Bloemfontein. In this presentation, the results from only two trials will be discussed.

The experimental site consisted of a 26 ha grass field interspersed with trees. Six carcasses were divided into three sample groups viz (i) daily, (ii) after five days, (iii) after ten days, each with a clothed carcass and an unclothed carcass wrapped in sheeting. Two additional unwrapped carcasses, one with clothes and one without, were sampled daily as controls. A 100 day trial during the winter months in 2003 (average daily temperature of 9°C) and a 50 day trial in the summer in 2004 (average daily temperature of 20°C) were conducted. The first insects to utilize the carcasses were adult Diptera. In the summer these were dominated by two species, *Chrysomya marginalis* and *Chrysomya albiceps*, with *Lucilia* spp. (*Lucilia cuprina* and *Lucilia sericata*), Muscidae (*Hydrotaea capensis* and other Muscidae spp.) and Sarcophagidae spp. present. In winter, there was a change in the dominant species present. These were *Lucilia* spp., *Chrysomya chloropyga* and *Calliphora vicina*, with few individuals of *C. marginalis*, *C. albiceps*, Muscidae (*H. capensis* and other Muscidae spp.) and Sarcophagidae spp. also present. However, during the winter months significantly fewer adults visited the carcasses.

In the summer months, oviposition was not delayed by the presence of wrapping or clothing. The adult Diptera were observed pushing through the smallest spaces to gain access to the carcasses, even if this resulted in wing damage or death when they failed to find an exit. In the winter months, oviposition was delayed by five days on the unwrapped carcasses and by nine days on the wrapped carcasses. In winter the carcasses remained acceptable to Diptera for an extended period. Oviposition continued up to 60 days after placement, whilst in the summer oviposition occurred within the first 3 days.

In summer, *C. marginalis* and *C. albiceps* maggots were dominant, with a low numbers of Sarcophagidae spp. In winter, no *C. marginalis* or *C. albiceps* maggots were found although the adults were recorded. Muscidae adults were present during both seasons, but no maggots of this family were recorded. Because of the short oviposition time during summer the maggots were of a similar age at any time, while the extended oviposition that occurred during winter resulted in different instar groups, often the same species, present at any time. The presence of the sheets in both seasons did allow the maggots to move more freely on the surface of the carcasses, especially in summer, when the maggot masses were much larger than in winter. The skin on these carcasses remained moist and was more easily consumed, while on the unwrapped carcass (especially the unclothed one) the skin dried out, becoming an unacceptable maggot food source. Less skin remained on the wrapped carcasses after the maggots migrated to pupate.

In either season, clothing and/or wrapping apparently had no influence on the Coleoptera community. However in the winter months, Dermestidae (*Dermestes maculatus*) larvae were found while dipteran maggots were still present on the carcasses. They were present when the carcasses were still moist and a fair amount of tissue remained. In summer, they were only present after maggot-migration and little tissue remained, although the wrapped carcasses still retained some moisture. Cleridae (*Necrobia rufipes*) and Histeridae spp. were present in both seasons.

Significant maggot mortality was associated with the wrapped carcasses in the summer trial. All dead maggots were found underneath sheets soaked

with decomposition fluids. The maggots were usually found along the back of the carcasses, which were facing east towards the rising sun. The fluid soaked sheets may have restricted the free flow of air, causing a significant increase in temperature and build up of metabolic heat generated by the maggot masses, or perhaps excessive build up of noxious gasses and insufficient oxygen flow.

Wrapping, Entomology, Succession

D39 The Current Status of the ABMDI Certified Medicolegal Death Investigator in the United States

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After attending this presentation, attendees will show the affect of ABMDI certification for medicolegal death investigators. This presentation will impact the forensic community and/or humanity by providing an understanding of the current status of the ABMDI certified medicolegal death investigator in the United States. The participant will be able to discern the affect of ABMDI certification on the job status for medicolegal death investigators and insight into future employment trends.

The creation of the American Board of Medicolegal Death Investigators (ABMDI) in 1998 established for the first time standardized criteria for the profession of medicolegal death investigation in the United States. Since 1998, over 700 individuals have met the criteria established by the ABMDI Board and Advisory Council to become Registered Medicolegal Death Investigators. The purpose of this study was to develop a profile of the current status of certified medicolegal death investigator, their professional responsibilities, and work environment, potential benefits of certification, and also to provide insight into the future direction of the profession.

Beginning in the fall of 2004, a national survey instrument was developed by the ABMDI to collect data pursuant to the study's objectives. The survey consisted of a number of questions in the following categories: Demographic Information including job title, years experience and salary; Employment Status, including caseload and case types investigated; Case Management Activities including documentation, standards followed and technology used to conduct investigations, as well as various professional job requirements, such as prerequisite skill requirements for employment, professional development activities, continuing education, and in-services to maintain employment and/or take advantage of promotion opportunities. In addition, questions were posed to determine if any interagency (law enforcement) interactions had changed since the achievement of certification.

The survey population consisted of each certified member of the ABMDI, both registry (Diplomats) and board certified (Fellow) levels. Since all members were included in the survey, no sampling methodology was employed. The survey procedures included pre-survey mail out notifications, followed by both hardcopy and electronic survey deployment via the U.S. mail and the Internet to all members. Non-respondent follow-up consisted of notification and re-deployment of the survey. The non-respondent follow-up process was repeated four times, once every 14 days, after which telephone follow-up of all non-respondents was conducted to ensure the highest response rate possible.

The results of the survey will establish a benchmark for the profession of medicolegal death investigation; its current status and future viability. All major data categories will be correlated to the achievement of the ABMDI certification in attempts to validate the efficacy of certification to the population of medicolegal investigators in the United States. Results

will be useful for educational program planners at agencies employing medicolegal death investigators, educational institutions preparing medicolegal investigators, and associations providing in-service, training or continuing education activities for the next generation of medicolegal death investigator, as well as current investigators seeking information about the advancement within the profession and individuals contemplating career opportunities in the field of medicolegal death investigation.

Medicolegal Death Investigator, Standardization, Employment D40 Forensic Autopsy Performance Standards - The Effect on Death Scene Investigation

Steven C. Clark, PhD, Occupational Research and Assessment, 124 Elm Street, Big Rapids, MI 49307*

After attending this presentation, attendees will be able to identify the medicolegal death investigator's role in the performance of the forensic autopsy. If the proposed NAME forensic autopsy performance standards are adopted and followed by the performing pathologist, this presentation will impact the forensic community and/or humanity by demonstrating how the medicolegal death investigator may have a significant role to play in the successful implementation of the standards and the resulting forensic autopsy.

Beginning in March of 2003, the National Association of Medical Examiners (NAME) formed a subcommittee within their Inspection and Accreditation (I&A) committee to investigate the possibility of developing organizational standards for the performing of the "forensic" autopsy. The members of the subcommittee, know as the NAME Standards Committee, were nominated by the I&A committee members and selected by the NAME President based on; jurisdictional size, system type, and the willingness to participate in the year long study.

The initial literature review focused on the identification of existing practice standards for forensic pathologists and the establishment of a membership profile to determine survey-sampling procedures. Based on the diversity of the membership, the committee determined that the methodology required to create a set of "acceptable" forensic autopsy standards would require an "open" research approach that encouraged comment and discussion both within the committee, as well as the general membership. A census, rather than sampling strategy, would be used in attempts to involve the entire NAME membership in the process.

From the existing materials reviewed, four data gathering instruments were developed and administered to members of the committee to begin the process of identifying the essential components of the forensic autopsy. These initial survey instruments were completed by 16 (80%) of the standards committee members at the annual NAME meeting in September 2003. The data collected was used to develop the first set of "performances" associated with the forensic autopsy. Those performances edited into performance objectives and presented to the committee at the next meeting held in Atlanta, December 2003.

After multiple revisions, refinements and reorganizations by several of members via emails and third draft for the performance standards were ready for full committee review in February 2004. After another round of revisions the committee approved the content of the standards document for release as a survey. Using a five-point Likert scale ("strongly agree to strongly disagree") each member would be asked to indicated their level of agreement on 177 survey items. Both electronic and hardcopy version were developed and then deployed to all general and emeritus members in April 2004.

In late March, a postcard announcement was sent to all members informing of the pending survey and its importance. The following week the first of four electronic deployments of the survey began followed by non-respondent telephone contacts. Data collection stopped on June 3, 2004 with a total of 465 (60.3%) surveys returned. All survey data were compiled and presented to the committee final review and consideration at a 3-day meeting in Atlanta, June 7-9.

Of those returned, 438 (90.5%) were from members and 73 (9.5%) were from emeritus members. Members from 48 states and six countries participated in the research, with California and Florida have the highest number of respondents (50), and 38 (90.4%) of NAME accredited offices participated. Members listed as board certified in AP/CP/FP made up 61.2% (254) of all respondents, while participant work experience averaged over twelve years. Of the 177 performance standards presented in the survey, 169 (95.4%) received an average rating between 4.0 (agree) and 5.0 (strongly agree), and one item (0.06%) having a median score below 5.0. Overall, agreement (strongly agree and agree) on the survey was 89.9%. There were 21 (11.8%) of the performance standards that at least 10% (46) individuals disagreed with (disagree and strongly disagree). Of the total, 4.15% of the responses were rated as “unsure,” while 1.2% received no response. In addition, over 2,200 comments were logged and categorized for committee review.

Summary: While reviewing the data presented for each standard (descriptive statistics and respondent comments), the committee debated the merits of each performance standard. To maintain the consensus methodology, the committee was reminded that if any one member did not agree with a specific standard, it would be removed. Based on review of the data and much discussion, 21 requirements were edited, four standard titles were modified, one new title was created, and 16 performance tasks were removed. The final set of proposed forensic autopsy standards consists of nine sections, 31 standards, and 153 performance tasks.

Forensic Autopsy, Standards, Death Investigation

D41 “The Most Dangerous Game” - The Case of a Double Homicide

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This presentation is designed to highlight a unique homicide and the problems related to crime scene assessment, and the advantages of utilizing a “cold case” homicide unit. This presentation will impact the forensic community and/or humanity by highlighting the benefit of an accurate crime assessment, which can allow an investigation to focus on the most probable motives for an offense and limit the suspect pool, enhancing the probability of the successful identification of a suspect.

Crime scene assessment is one of the most important steps in homicide investigation. The ability to discern possible motives from interpretation of a crime scene is paramount to the successful identification of a “pool” of potential suspects. The quicker an investigation can focus on a single line of investigation, the more likely a single suspect can be identified.

The FBI’s National Center for the Analysis of Violent Crime (NCAVC) is routinely consulted by federal, state, and local authorities in a variety of cases of bizarre and repetitive violent crimes, especially homicides. NCAVC assistance was requested by local authorities in regards to a case involving the shooting deaths of two hunters who were found in a wooded area of public lands. The victims were both shot in the back with the shotgun belonging to one of the victims. Both victims had been hunting and each was armed, one with a shotgun, the other with a muzzle-loading rifle.

The initial investigation focused on the drug connections of one of the victims, who was engaged in selling drugs. The investigation did not establish any direct connection between the victims. The police contacted a local law enforcement agency to conduct an assessment of the crime scene and provide a “profile.” Their opinion was that this crime was either a revenge killing or a thrill killing. The investigation floundered for 10 years.

The case was re-opened as a cold case, and the investigators reviewed the entire case. Based upon their review, they began to focus on other possible motivations. The cold case investigators contacted the FBI’s

NCAVC for a crime scene assessment and an opinion as to motive. NCAVC’s assessment was that the motive for this crime was not robbery, revenge, or a drug killing but proprietary and was based upon the location where the killings took place.

The investigators had been suspicious of the man who owned the land adjacent to the public land where the victims were found. He was also the person who had found the shotgun used to kill both victims. He was overly protective of his property and had in the past threatened people on the public lands with a weapon. He was also a former law enforcement officer.

A thorough follow-up investigation revealed the subject was unaccounted for at the time this crime took place, and he had made several inconsistent statements regarding his whereabouts. The subject also misrepresented his activities during the time the crime scene was being conducted, and he had taken several acquaintances to the exact crime scene without having been at the scene. Investigators focused their efforts on an individual who provided the subject’s alibi at the time of the murders.

After the convening of a Grand Jury, the subject was indicted and charged with the murders of both hunters. The trial resulted in a guilty verdict.

This case highlights the benefit of an accurate crime assessment, which can allow an investigation to focus on the most probable motives for an offense and limit the suspect pool, enhancing the probability of the successful identification of a suspect.

Crime Scene Assessment, Cold Case, Homicide

D42 Tractor Man: The Nation’s Capitol Held Hostage

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This presentation is designed to highlight the many components of a dangerousness assessment done in support of a post 9/11 critical incident negotiation through the presentation of an unusual case. This presentation will impact the forensic community and/or humanity by highlighting the difficulties faced by law enforcement and professionals from related disciplines in dealing with dangerousness assessment, including determining future dangerousness, locating indicators of suicide, and preventing the hasty use of deadly force.

Critical incident dangerousness assessments are, by their very nature, complicated and emotionally intense because of pressure from the political establishment, media, community, and family members. Investigators and professionals from related disciplines face many challenges because of the lack of clear and convincing on-site evidence pertaining to the offender’s true mind-set, motivation and capabilities. On March 17, 2003, Dwight Watson had a legal permit to distribute literature describing the plight of the nation’s tobacco farmers. When approaching the Washington Monument, Watson veered his John Deere tractor into a shallow pond at Constitution Gardens near the monument and began a 47-hour standoff with law enforcement. He claimed to have weapons, including “organophosphate bombs” in the tractor with him. The incident began on the same day that the Department of Homeland Security elevated the terror threat level to Code Orange, a heightened state of alert that preceded the beginning of the American led assault on Iraq on March 20.

Four Federal law enforcement agencies responded including three SWAT teams, three bomb technician teams, two negotiations teams, the FBI’s Evidence Response Team and HAZMAT team. The NCAVC responded in support of the negotiation component. Federal, state, and local authorities in a variety of violent crimes including threat assessments and dangerousness assessments, routinely consults the FBI’s National Center for the Analysis of Violent Crime (NCAVC). Initial information indicated that Watson was violent, possibly suicidal, and hence very dangerous. There was conflicting preliminary investigative background

information on the offender regarding violent acts and suicidal tendencies.

The NCAVC team initiated investigative leads to clarify Watson's background, life situation, and any factors that could contribute to a suicidal state of mind. The NCAVC analyzed the results of investigative leads and conducted on-site interviews of Watson's family members who had traveled to the scene. The NCAVC provided on scene commanders with a dangerousness assessment that stated Watson was not a risk for future violence and would surrender himself by his self-imposed deadline of March 19. A tactical assault was not warranted.

During the two day standoff there was an array of political media and public pressure to utilize a dynamic tactical response to assault Watson's position and end the standoff, thus eliminating the huge disruption to the nation's capitol. On March 19 Watson turned himself over to police custody. Watson had a dummy hand grenade and several cans of bug spray with him in the tractor. He did not have any weapons, ammunition, or other dangerous items or material in the tractor. A subsequent search of the tractor conducted by bomb technicians and the FBI HAZMAT team could find no materials posing credible threat.

The issues in this case highlight the difficulties faced by law enforcement and professionals from related disciplines in dealing with dangerousness assessment, including determining future dangerousness, locating indicators of suicide, and preventing the hasty use of deadly force.

Suicide, Dangerousness Assessment, Suicide

D43 The Corrosive Effect of Blood Regarding the Forensic Identification of Fired Projectiles

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Attendees will be briefed on the proper collection and storage of projectiles collected from the bodies of shooting victims so that the corrosive effect of blood does not destroy the microscopic markings used in forensic firearms examination

This presentation will impact the forensic community and/or humanity by demonstrating that blood has a corrosive effect on projectiles. In addition, it will establish a method of collection and storage that prevents this destruction, so that forensic firearms evidence is not lost.

The goal of this presentation is to present to the forensic community, particularly surgical personnel and forensic pathologists, a study that demonstrates the destructive nature of blood in prolonged contact with projectiles and how this contact hinders forensic identification of the projectiles.

This presentation will review a portion of a study conducted for the purposes of a Master's Thesis. This study examined if blood hampers forensic firearms examiners' efforts to connect a projectile to other projectiles or a particular firearm. Because bullets are often recovered from victims of shootings, blood may be left on the projectile or the projectile may be stored in a container with blood. The main objective of this study was to determine if this blood destroys the microscopic markings used by forensic firearms examiners in classifying and identifying bullets. An additional objective of this study was to begin to understand what component or components of blood play the greatest role in the damaging of bullets. The final objective of this study was to determine if desiccants or a particular storage method could prevent or lessen the damage caused by blood.

This study focused on blood's effects on recovered evidence bullets. In particular, the problem to be examined involves projectiles that are recovered from a victim of a shooting. As it can be inferred, blood first contacts the projectile as it enters the body. The location of this entry is referred to as the entrance wound. The bullet may pass completely through the body, leaving through an exit wound. Many times, the bullet will remain in the body. This study will focus on those projectiles that remain in the body and that are completely surrounded by blood and bloody tissue.

These projectiles are usually removed from the body by a surgeon or a forensic pathologist. After a projectile is recovered from the body of the victim, body fluids (specifically blood) may remain on the specimens. It has been observed that the microscopic markings used to identify these projectiles are not present or are present to a lesser degree on these specimens.

The methodology of this study was based on the above factors and the observations of forensic firearms examiners. This study focused on copper jacketed projectiles that are removed from a patient in a hospital or morgue setting. It was structured to recreate evidence, as it is seen in the crime laboratory. A semiautomatic firearm was shot into a recovery medium to obtain the projectiles for this study. Three test fires were obtained and stored as a reference sample. The reference sample was used as the standard in all microscopic comparisons. Additional test sets were created where the copper jacketed projectiles and other materials were placed in a specimen cup that was sealed until the time of comparison. The materials placed in the specimen cup differed depending on the desired variables. The projectiles were removed every fifteen days and subjected to microscopic examination and comparison to the reference set of projectiles.

As a result of these experiments, it was determined that blood does damage projectiles and that this damage hinders a forensic firearms examiner's analysis. This damage increases over time, consuming the identifiable markings of the projectile. In addition, both lysed red blood cells and serum play a role in the destruction of the bullets. It appears the damage was caused by the concert of materials that make up whole blood. Although no correlation can be made between the addition of desiccants and the slowing of the destruction to the bullets, proper collection and storage was determined to stop the corrosive effects of blood. To ensure that this damage does not occur, it is recommended that the projectiles be rinsed with water before they are placed in a storage container. If trace material must be recovered from the bullet, filter mechanisms can be added to this process.

Firearms Examination, Projectiles, Blood

D44 Performance Characteristics of Two ELISAs for Preliminary Test of Urine Specimens From Patients Under Flunitrazepam Treatment

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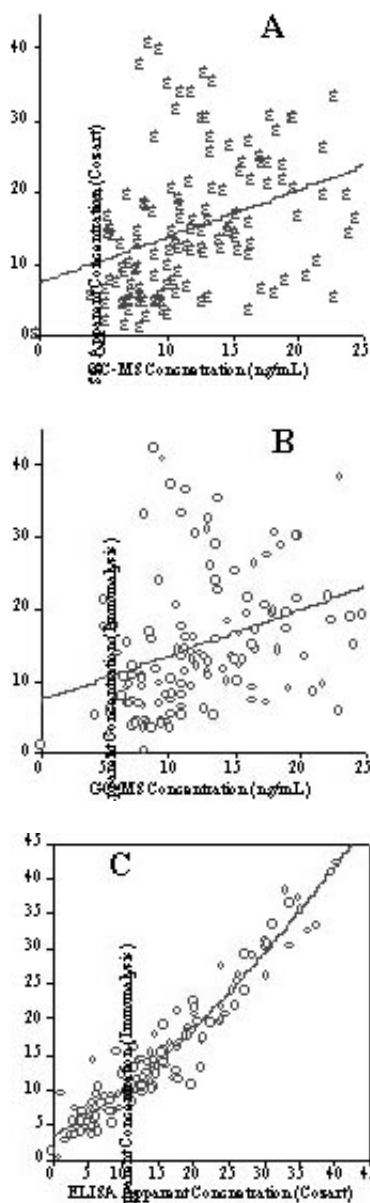
Following the establishment of a two-step protocol [1] for high-volume analysis of urine specimens to detect flunitrazepam (FZ) exposure, this study compares the performance characteristics of two commercially available ELISA kits and ascertains corresponding cutoffs suitable for the immunoassay/GC-MS testing strategy.

This presentation will impact the forensic community and/or humanity by facilitating the development of an effective approach for high throughput detection of flunitrazepam exposure through the commonly adapted two-step immunoassay-GC/MS test strategy.

In an earlier study [1], the authors have demonstrated that Cozart Flunitrazepam Metabolite Micro-Plate EIA (Cozart Bioscience Ltd., Oxfordshire, UK), but not other general-purpose benzodiazepines EIA (such as TDx, Beckman, CEDIA, Cobas Integra, EMIT II Plus), can be effectively used for the preliminary test of urine specimens for FZ exposure. With FZ-specific ELISA from Immunalysis Corp. (San Dimas, CA) now readily available, its performance characteristics are examined

and compared to the Cozart product adapted in the earlier study. Neogen Corp. (Lexington, KY) has also marketed FZ-specific ELISA. However, it was not included in this study because calibration standards needed for producing semi-quantitative data were not available. A total of 144 urine specimens collected from 11 patients were studied to compare the performance characteristics of these assays. The resulting data were also evaluated to ascertain corresponding cutoffs suitable for the two-step immunoassay/GC-MS testing strategy. The concentrations of 7-amino-FZ

data generated by two FZ-specific ELISA reagents



Manufacturer	Correlation equation	Correl. coef.	Immunoassay 7-amino-FZ concn. (y) corresponding to 6 ng/mL GC/MS concn (x)
Cozart	$y = 7.247 + 0.6465 x$	0.1176	11.1 ng/mL
Immunoanalysis	$y = 8.294 + 0.5795 x$	0.09837	11.8 ng/mL

Data shown in Figure 1 and Table 1 suggest: (a) the performance characteristics of these two ELISA are very similar, with the Immunoassay product generating slightly higher responses (Figure 1C and last column of Table 1); (b) if all specimens are diluted by a factor of 5 before testing and 10 (or more precisely 11) ng/mL is adapted as the cutoff (corresponding to 50 ng/mL in the undiluted specimen) for the preliminary test, those tested positive are likely to contain 6 ng/mL (or 30 ng/mL in the undiluted specimen) 7-amino-FZ as determined by GC/MS. With both ELISA calibration optimized at the 0–25 ng/mL range, 5-fold specimen dilution and 10-ng/mL cutoff may work well for both products. The corresponding GC/MS may then be set at 30 ng/mL (undiluted specimen).

It was also noted that both ELISA are free from interference by many drugs (and their metabolites) that were prescribed to the patients in combination of FZ. These drugs include bromazepam (Lexotan), triazolam (Halcion), alprazolam (Xanax), clonazepam (Rivotril), venlafaxine HCl (Efexor), glibenclamide (Daonil), haloperidol (Haldol), zotepine (Lodopin), chlorpromazine (Wintermno), trihexyphenidyl (Artane), carbamazepine (Tegretol), lithium (Camcolit), and amlodipine basylate (Norvasc).

1. Wang P-H, Liu C, Tsay W-E, Li H-H, Liu RH, Wu T-G, Cheng W-J, Lin D-L, Huang T-Y, Chen C-H: Improved Screen and Confirmation Test of 7-aminoflunitrazepam in Urine Specimens for Monitoring Flunitrazepam (Rohypnol) Exposure; *J Anal Toxicol* 26:411-418; 2002.

Need Key Words

D45 Detection of *Canis familiaris* Signature Odor Chemicals in Human Remains Using Derivitization/SPME/GC/MS

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After attending this presentation, attendees will understand the importance of analytical analysis of canine work. This presentation will impact the forensic community and/or humanity by proposing to identify the components of human decomposition that human remains canines alert to while conducting search and recovery missions. The results of this experiment can be used as a means of establishing reliability standards for such canines and validating the work that they do. The goal of this project is to help validate and improve upon the reliability standards associated with human remains detection canines.

Detector dogs have successfully established themselves as an invaluable aid to law enforcement and forensic officials. For over thirty years, the United States has sought the help of canines for such purposes as narcotic and explosive detection. While it is generally accepted that canines possess a superior sense of smell due to their abundant olfactory

in all specimens were first determined by GC/MS. These specimens were then diluted by a factor of 1, 5, 10, or 20 to bring the concentration of 7-amino-FZ in these specimens to the dynamic range of the immunoassays (50 ng/mL or less).

Shown in Figures 1A and 1B are correlation plots of the GC/MS data against the data derived from Cozart (A) and Immunoanalysis (B) reagents, respectively. The correlation of the two set of immunoassay data is further shown in Figure 1C. Resulting correlation parameters derived from Figures 1A and 1B are listed in Table 1.

Figure 1. Correlation of GC-MS data against ELISA data derived from Cozart (A) and Immunoanalysis reagents and correlation of ELISA data derived from these two manufacturers.

Table 1. Immunoassay-GC/MS data correlation parameters derived from

receptors, what it is that they smell and how they are able to distinguish between scents, for the most part, is still a mystery. For forensic purposes, it is extremely important to be able to scientifically validate the work of canines. One way to accomplish this is by successfully determining to which compounds the detector dogs alert.

The focus of this study will be on human remains canines (a.k.a. Cadaver Dogs). These dogs are specially trained to alert to the scent of human decomposition. As such, when they are employed it is crucial that they consistently alert to human remains as opposed to being distracted by the surrounding environment. Distractions can come in many forms including sewage, decaying vegetation, and other decomposing animals. Consequently, it is vital that the odor of human remains is characterized and therefore distinguished from that of other scents, especially other mammalian remains. In an effort to accomplish this, a comparative study of decaying pigs and cows has been conducted.

The canines used for this study are actively employed and certified by the Miami Dade Police Department. Weekly field tests with the suspected compounds, human samples, and animal samples were conducted. In an effort to avoid conditioning the canines to any confounding variables, the searching procedures have been established and are implemented by the handler. In addition, some experiments were blind (where the handler was not aware of the presence or absence of a sample) and some were not. This was done to help assess the amount of influence (and subsequent bias) the handlers imposed upon their canine partners. Field tests have shown a complete lack of interest in varied forms of cow remains and distracters including human sweat and perfume. Conversely without fail, they have alerted to assorted forms and quantities of human remains including dried blood. Additionally, a high percentage of alerts were contributed to such standard chemicals including dimethyl-disulfide, butyric acid, and hexanoic acid.

The dynamic process of human decomposition culminates in the breakdown and release of an array of biological compounds. Several studies have been conducted to gain insight into the process of human decomposition and separate studies have been conducted on human remains canines. However to date, information on which decomposition chemicals the cadaver dogs alert to is not available. For this study, approximately fifteen compounds have been the focus and they were subsequently broken down into the following five categories: biological amines, alcohols/cresols, indoles, methyl sulfides, and organic fatty acids.

In order to identify and quantify the chemical composition of the samples, headspace analysis by solid phase microextraction/gas chromatography/mass spectroscopy (SPME/GC/MS) was conducted on both a DB5-MS column and a Fatty Acid Methyl Ester (FAME) column. Due to the nature of the compounds present in human remains (highly polar to highly basic) derivatization is needed on the standard column. An on-fiber method containing chloroformates for the basic amine components and BFTSA for the polar acidic counterparts is currently being optimized for the standard column. However, the use of the FAME column is being investigated as an alternative to the manual derivatization process. The method developed allows for the rapid detection of odor signature chemicals emanating from decomposing human remains and is helping to identify the dominant chemicals used by cadaver dogs to reliably locate human remains.

Human Remains, Animal Remains, Canine Scent Identification

D46 DNA Extraction of Desiccated Contact Lens Using the Medium Chelex® 100

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After attending this presentation, attendees will understand that Chelex® is a viable means for extraction of amplifiable DNA from

desiccated contact lenses. This protocol is preferred over an organic extraction method such as phenol/chloroform as it is a faster, less hazardous extraction protocol, using a single tube thereby greatly reducing the potential for introducing laboratory contaminants.

This presentation will impact the forensic community and/or humanity by demonstrating that dehydrated contact lens may be collected and used as a source of evidence in order to link a suspect or victim to a crime scene. Because only one person, which is not always the case with a toothbrush or hairbrush, uses contact lenses for example, no mixtures would be encountered giving way to a positive identification that does not require further testing to resolve a potential mixture of genotypes.

The study performed during the Ronald E. McNair summer research program, (supported by USDE grant # P217A030070) will be presented on this poster. It will be demonstrated that exposure time of a soft contact lens to the ambient environment, for up to 72 hours, will not significantly affect the ability to extract, amplify, and type DNA as tested at the D1S80 locus. This poster will also demonstrate that Chelex® is a viable means for extraction of amplifiable template. This protocol is preferred over an organic extraction method such as phenol/chloroform as it is a faster, less hazardous extraction protocol, using a single tube thereby greatly reducing the potential for introducing laboratory contaminants.

Because crime scenes, areas of mass disasters, and unmarked graves sites are unpredictable, evidence recovered at such locations can also be unpredictable, creating a need for the forensic science community to look at unusual matrices as potential sources of DNA used for identification. The DNA found on such substrates may be limited in both quality and quantity making it necessary to subject extracts from the matrices to PCR prior to analysis. A recent report demonstrated that amplifiable DNA was successfully isolated from contact lens fragments using the phenol/chloroform method (Wickenheiser & Jobin, 1999). To study the comparative effectiveness of other, less hazardous DNA extraction methods on DNA left on desiccated contact lens, this pilot study was conducted.

A total of three brands of contact lenses (Acuvue®, Bausch & Lomb and Focus Dailies®) were donated by five volunteers and subjected to a dry environment for either 24, 48, or 72 hours. Buccal scrapings were performed on each individual in order to establish a reference genotype for D1S80. The DNA from both the reference samples and the lenses were extracted using Chelex®, the D1S80 alleles were then amplified and typed using a vertical polyacrylamide gel on an ABI Prism 377XL DNA sequencer.

The preliminary results indicate that an inverse relationship exists between exposure time and quality of DNA recovered: as the “dry” exposure time increases, the DNA quality decreases. Genotypes identified from three out of the five desiccated lens (exposure times of 24 and 48 hours) matched the alleles for their corresponding buccal sample. DNA was recovered from the remaining two lenses (dry for 48 and 72 hours) but appeared to be severely degraded and could not be typed. The successful typing of the three lenses indicates that the Chelex® protocol is an adequate method for extracting DNA.

In order to resolve the difficulty in the recovery of DNA from some of the samples, the preservation and storage of the lenses needs to be enhanced in order to eliminate any continual degradation of the DNA. Although the procedure used was relatively successful, it may be helpful to incorporate an additional step to purify the DNA prior to PCR such as filtration purification (i.e., Microcon YM100).

The results obtained demonstrate that dehydrated contact lens may be collected and used as a source of evidence in order to link a suspect or victim to a crime scene. Because only one person, which is not always the case with a toothbrush or hairbrush, uses contact lenses for example, no mixtures would be encountered giving way to a positive identification that does not require further testing to resolve a potential mixture of genotypes.

This is the initial study undertaken by the researcher, with further, in-depth study being planned using the 13 loci used by the forensic community.

Contact Lens, DNA Extraction, Chelex

D47 Rearing of *Chrysomya megacephala* (Diptera: Calliphoridae) at Different Population Densities

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Attendees will learn that larger densities of *C. megacephala* will result in smaller and lighter puparia and adults. Also, larger numbers will result in increased mortality in the larval stage. This presentation will impact the forensic community and/or humanity by providing additional information on insects used as forensic indicators.

Chrysomya megacephala and *Chrysomya rufifacies* are the primary invading Diptera species found on decomposing carcasses and corpses throughout O'ahu, Hawaii. These two species are in the family Calliphoridae, which are commonly known as blowflies. *C. megacephala* and *C. rufifacies* are found during the first, second, third, and fourth stages of decomposition. These two species both feed on flesh and tissue. When their food source is depleted or larval development complete, larvae will leave the carcass for pupariation. *C. megacephala* larvae feed only on corpses and carcasses, while; by contrast, the *C. rufifacies* larvae feed on the corpse or carcass, prey on other larvae, and sometimes cannibalize its own species. There has not been a significant amount of research on interactions between these two species, even though they are frequently found on corpses in large numbers. Frequent occurrence of these larvae makes them a very important part of solving deaths in Hawaii. Does the density population of *C. megacephala* have an effect on the rate of development? The hypothesis is that large densities will result in smaller and lighter puparia and adults. It is believed that large numbers will result in increased mortality in the larval stage. Can *C. rufifacies* display cannibalistic or predatory behavior when the food source is limited? From previous work (Goodbrod & Goff 1990), the hypothesis of this study is that *C. rufifacies* is both predatory and cannibalistic.

In order to test these questions, it was necessary to establish colonies of larvae by collecting a large number of eggs. Larvae were separated into individual containers at specific densities of 100, 150, 200, 250, 300, and 400 larvae/12.5g of beef liver. Then the cultures are replicated a total of 6 times. Larvae were reared in Tupperware containers with a hole cut out of the top and covered by organza material. The organza material permits airflow. They were supplied with a limited food, 12.5g of beef liver, and given a few drops of water everyday using a transfer pipette to keep the liver moist. Puparial and adult stages lengths and weights were recorded. Two colonies were established with a 50/50 ratio of *C. megacephala* and *C. rufifacies*. This was done to observe the survival of larvae of the two species when in competition for a limited food source. There were not many trials of these because a limited amount of *C. rufifacies* was recovered from the host. Mortality was calculated based on puparial development and adult emergence.

In all six cultures initiated at first instar, the weights ranged from .010g to .032g. The lengths ranged from .543cm to .788cm. In all six cultures initiated at second instar, the weights and lengths were slightly larger. This could be because these larvae fed on the host a little longer than the first instar larvae. The greatest weight, in all of the second instar cultures was .037g and the smallest was .016g. The shortest length was .598cm and the longest was .800cm. The 100 puparia densities were larger in length and weight because there were fewer larvae feeding on the constant food source. The 400 puparia densities were the smallest because there were a great number of larvae feeding the 12.5 grams of beef liver.

The weights and lengths increased as the population became less dense. When the mortality rates were averaged between the three cultures and then divided by the density number the results verified the hypothesis. Rearing of *C. megacephala* in pure cultures at six different density

dependent populations displayed a direct relationship between density versus length and weight of the larvae. The survival rates decreased at the greater densities. Puparial and adult lengths and weights decreased as population densities increased. Within the cultures reared with the *C. megacephala* and *C. rufifacies*, the *C. rufifacies* showed cannibalism and also was predatory on *C. megacephala*. USDE grant number P217A030070 supported this research.

Chrysomya, Diptera, Population Density

D48 Canine and SPME/GC/MS Detection of Microbial Volatile Organic Compounds Emitted From *Stachybotrys chartarum*, *Penicillium chrysogenum* and *Aspergillus versicolor*

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After attending this presentation, attendees will understand the process of mold detection by the identification of microbial volatile organic compounds. This presentation will impact the forensic community and/or humanity by educating the forensic community on the work being done on validating mold detection processes via canine and SPME/GC/MS analysis.

Indoor mold growth is a serious problem all over the world. Mold exposure has been linked to acute and chronic adverse health effects and even death in humans and animals. These adverse health effects vary depending on the levels of exposure and the strength of one's immune response, but may include vomiting, hemorrhaging, chest pain, nephritic congestion, and necrosis of tissues. Certain molds even have carcinogenic potential. Mold spores are airborne particles, which can travel into virtually any environment and are often deposited indoors. The growth of mold is dependent on humidity, temperature, and a supply of nonliving organic material, which serves as a nutrient source. When adequate conditions exist, mold is able to flourish, often undetected. As it grows, mold produces several types of secondary metabolites, namely antibiotics, mycotoxins, and microbial volatile organic compounds (MVOCs). Mycotoxins are the most toxic of the fungal secondary metabolites, but are generally nonvolatile, as they are relatively large molecules. The volatile secondary metabolites, MVOCs, are emitted from flourishing molds, and may be species-specific. It may be possible to detect fungal growth down to the species level based on the composition of the microbial volatile organic compounds emitted from a culture.

Law-enforcement agencies, forensic scientists, and the military have used canine detection for many years throughout the world. Canis familiaris, or domesticated dogs, have been specially trained to detect a variety of target compounds emitted from the source via olfaction, whether it be ignitable liquid residues, volatile compounds from explosives, or degradation products from human remains. Canines display an ability to discriminate between similar or partial odor signatures, so it is important to know the complete volatile composition of what is being detected. The advanced olfactory system canines possess allow them to detect compounds down to the parts-per-billion level, significantly past the point where human olfactory capabilities fail. This study is researching what target compounds are being emitted from three problematic species of molds: *Stachybotrys chartarum*, *Aspergillus versicolor*, and *Penicillium*

chrysogenum.

Cultures of *Stachybotrys chartarum*, *Aspergillus versicolor*, and *Penicillium chrysogenum* were obtained from ATTC in Manassas, Virginia. Samples of each species were grown in vitro and purified in the laboratory. *Stachybotrys chartarum* was grown and purified on corn meal agar; *Aspergillus versicolor* and *Penicillium chrysogenum* were grown and purified on potato dextrose agar. All samples were cultured in triplicate. Headspace analysis was conducted using solid phase microextraction/gas chromatography/mass spectrometry to determine the specific odor signatures of the volatile metabolites for each species. Species-specific mold drywall training aids were obtained from a local canine training facility and headspace analysis was conducted using solid phase microextraction/ gas chromatography/mass spectrometry as well. Sample extraction conditions were optimized by varying the fiber types, the time of sample exposure, and the amount of sample being analyzed.

This study aims to address the effect of varying concentrations of molds and length of time molds are allowed to grow on the odor signatures obtained via SPME/GC/MS analysis for both the pure mold cultures and the inoculated drywall training aids. Also, by contrasting the spectra obtained from SPME/GC/MS analysis of the headspace of the pure mold cultures and the drywall-inoculated training aids, it could be determined what compounds specifically the canines are being trained to detect, thereby enabling a critique/validation of the training process which canines are undergoing today in the mold detection industry.

Microbial Volatile Organic Compounds, Canine Detection, SPME/GC/MS Detection

D49 Mitochondrial DNA-Based Identification of Family Calliphoridae and Sarcophagidae

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The goal of this presentation is to present to the forensic community the implementation of mitochondrial DNA methodologies and sequence data from population samples of a calliphorid and sarcophagid species in Hawaii.

This presentation will impact the forensic community and/or humanity by providing the sequence data from sarcophagids and calliphorids from Hawaii, which will be entered into GenBank so that the forensic community may have population samples from this location to aid in quick identification of these species for estimation of postmortem interval.

Forensically important insects collected on a decomposing body offer a unique opportunity to estimate time of death (or postmortem interval, PMI) if the species can be positively identified. Many adult carrion-flies are easily distinguishable, but the larvae are not. The most common flies to inhabit a human corpse in Hawaii are blowflies from the family Calliphoridae and fleshflies from the family Sarcophagidae. Sarcophagid flies have many characteristics that make them ideal forensic indicators. However, their utility is limited because it is difficult or impossible to determine the species of a sarcophagid larva (Wells Pape and Sperling 2001). The same holds true for calliphorid species in different developmental life stages. Identification of the immature blowfly larvae is more difficult and sometimes impossible (Schroeder Klotzback 2002).

The rationale for this study follows the work of Wells and Sperling et al (2001) by providing an alternative method to using morphology in identifying indistinguishable larvae by use of mitochondrial DNA (mtDNA) sequence data and phylogenetic analyses. The collection of his work throughout the years and the work of other scientists has produced a useful database providing sequences to different arthropod species. The database, however, is limited to species common on the mainland and continental regions. Since the Hawaiian Islands are the most isolated

archipelago in the world, with regular species likely introduced from Asia, Australia, the U.S. mainland and other Pacific Islands, the array of sarcophagids and calliphorids in Hawaii is slightly different than in any of these individual locations. As Hawaii blowflies and fleshflies represent populations different from their ancestral (Asian, Australian, etc.) ones, sequences for a given species in Hawaii may likely differ from those reported thus far. Adding sequence data from such flies found in Hawaii, will be useful to compare these with already published sequences, especially if the sequences for a given species differ from previously reported ones. Therefore, the study is assuming that mtDNA regions will be similar but not identical from species in different locations and that isolation of mtDNA from larvae will be relatively straightforward.

In this pilot study, an organic extraction of mtDNA was made with single flies and single larva of *Chrysomya megacephala* and *Sarcophaga ruficornis*. Specific fragments of the cytochrome oxidase subunit one (COI) region of the mitochondrial DNA were amplified using polymerase chain reaction (PCR). Locations of primers used in this study were taken from Wells and Sperling et al 1999 – CI-J-2183 and CI-N-2659. Amplified sequences were obtained and sequenced at the Biotechnology CORE facility at the University of Hawaii Manoa Campus using two Applied Biosystems 377XL DNA Sequencers. Analysis of sequences were compared to Wells and other published sequences accessible online using the BLAST search engine of the National Center for Biotechnology Information. For each pair of species example, the amplified fragment was approximately 523 base pairs long in *C. megacephala* and approximately 498 base pairs long in *S. ruficornis*. Sequences are currently being analyzed, and a full report will be presented in the poster. Initial study indicates between 53 and 58 nucleotide changes between *C. megacephala* and *S. ruficornis* in this region. Sequences from the Hawaii specimen of *C. megacephala* were very similar but not identical to previously reported *Chrysomya megacephala* from Australia or South Africa, having 7 nucleotide differences. Preliminary sequence analysis and searches in GenBank with *S. ruficornis* indicated the closest relatives were *Chrysomya norrisi* and *Lucilia adisoemartoi* having 41 nucleotide differences each, from both species. Results obtained aid in the quick identification of sarcosaprophagous arthropods in estimation of postmortem interval (PMI). Mitochondrial DNA is a successful and valuable tool in the application of forensic science. This research was supported by USDE grant #P217A030070.

Mitochondrial DNA, Calliphorids, Sarcophagids

D50 Evaluation of Plastic Microdevices for Isolation of Sperm Cells From Sexual Assault Evidence

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After attending this presentation, attendees will learn the advantages and disadvantages of using plastic microdevices for isolation of sperm cells from sexual assault evidence as compared to glass microdevices and conventional differential extraction.

This presentation will impact the forensic community and/or humanity by exciting the forensic community with the possibility of improved analysis time, separation efficiency, and purity in a disposable microdevice that has the potential for integrating multiple processing steps. The prospect of dramatically reducing the rape kit backlog will be especially appealing.

Differential extraction, the conventional method for isolating male and female fractions of DNA from sexual assault evidence, is a time-consuming sample preparation step in forensic DNA analysis. The goal is to develop a means to reduce the time associated with isolation of the male and female DNA fractions, while maintaining or improving the recovery and purity. The means through which it is proposed the goal is achieved by the use of microfabricated glass and plastic devices for separation of male and female cells.

The brief record that exists for miniaturization of analytical processes on microchip platforms has demonstrated reductions in analysis time (versus conventional methods) with no loss of analytical capability. Microchips also provide the potential for integrating multiple processing steps in a single device and automating the processes. Since differential extraction is only one of a sequence of processes required for forensic DNA analysis, replacing it with a microdevice method provides a distinct advantage in the path toward integration of multiple sample preparation steps (DNA extraction, DNA quantitation, and PCR amplification) on a single device. In addition and not insignificantly, microchips can be designed to accommodate parallel processing of both the male and female DNA fractions.

The centrifugation and filtration steps associated with conventional differential extraction prevent its direct translation to the microchip format. Thus, a novel method for obtaining isolated male and female fractions of DNA on a microfabricated device was developed and involved separating the sperm cells from mixtures of sperm and epithelial cells as would be recovered from sexual assault evidence. The DNA from each cell type can then be extracted independently, allowing separate male and female DNA fractions to be obtained.

The separation or "cell sorting" developed exploits differential physical properties between the two cell types such as buoyant density, size, shape, and proclivity for adsorption to the microchannel surface. In an etched glass microchannel sperm cells could be transported to an outlet reservoir while the epithelial cells were retained in an inlet reservoir by application of a volumetric flow rate of approximately 1 nL/sec, or about 1.6 sperm/sec, provided by a mechanical pump. Experiments employ digital video microscopy to visualize the cell separation and demonstrate the purity and efficiency of the process.

The use of plastic microfluidic devices was explored in an effort to make lab-on-a-chip technology more affordable, and to provide the possibility of disposable devices. Disposable, single-use devices are of interest in forensic applications because they eliminate cross-contamination between samples. The cell separation and free DNA separation techniques developed for glass microfluidic devices were tested on plastic microfluidic devices. Initial tests indicated that plastic devices were sufficient for this purpose, but experiments were carried out to determine the cell separation efficiency and purity.

Here the characterization of plastic microdevices with respect to cell separation efficiency and purity is presented. The purity of the fractions was assessed not only through digital video microscopy but also by short tandem repeat analysis, the method used for genetic identification in forensic analysis. Each fraction should show a single-donor DNA profile if the cell separation is successful. More realistic samples that have lower numbers of sperm and have been dried over a set aging period were also introduced. Any additional techniques developed for the glass microdevices have also been translated to the plastic microchips.

Microfluidic Device, Vaginal Swab, Sexual Assault

D51 Reduction or Elimination of Observed Reproducible Artifacts in the AmpF/STR® Identifiler® PCR Amplification Kit

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After attending this presentation, attendees will have an increased understanding of the continual efforts of Applied Biosystems to improve the quality of their products used by forensic community at a technical level.

This presentation will impact the forensic community and/or humanity by demonstrating how the forensic community will benefit from an understanding of both the steps taken to improve the performance of the AmpF/STR® Identifiler® PCR Amplification Kit, and the subsequent studies to validate the kits produced with the updated manufacturing procedure.

This presentation will discuss the reduction or elimination of observed VIC® and PET® artifacts in the AmpF/STR® Identifiler® PCR Amplification Kit, and the subsequent validation study of the updated kit. The Identifiler® kit is a STR multiplex assay that amplifies 15 tetranucleotide repeat loci and the gender determining marker, Amelogenin in a single PCR amplification. Loci are genotyped using the Identifiler® Allelic Ladder after running samples on an ABI PRISM® Genetic Analyzer. The Identifiler® kit is widely used in both forensic and paternity applications.

Within the Identifiler® Kit, a VIC® dye labeled artifact was observed at approximately 120 bps, within the range of the D3S1358 loci. PET® dye labeled artifacts were observed between the Amelogenin and the D5S818 loci at approximately 110 to 130 bps. These artifacts were reproducible and could be detected as labeled alleles or off ladder alleles (OL Alleles) during data analysis. In order to reduce or eliminate these artifacts, modifications were made in the manufacturing process of the Identifiler® Kit (PN 4322288) effective from lot number 0310018 onwards. These modifications reduced the artifacts observed in analyzed samples amplified with the PET® dye and VIC® dye labeled primers, without compromising the performance of the Identifiler® Kit.

In order to address the PET® dye artifacts, a modification in the manufacturing process of the PET® primers was introduced, which importantly, did not alter the PET® dye primer sequences. Non-nucleotide linkers, which enable reproducible positioning of the alleles to facilitate inter-locus spacing, are used in primer synthesis between the primer oligonucleotides and the dye. The PET® dye artifacts were observed to be correlated with the use of a particular non-nucleotide linker and therefore it was possible to diminish the appearance of the artifact by using a different non-nucleotide linker during synthesis of the PET® dye labeled primers.

In order to address the VIC® dye labeled artifact, an additional step was introduced into the purification process of the VIC® dye labeled primers. This resulted in the significant reduction in the observation of VIC® dye artifacts.

For the Identifiler® Kit produced with the updated manufacturing steps (lot number 0310018 onwards), validation studies were performed according to the DNA Advisory Board's "Quality Assurance Standards for Forensic DNA Testing" and the Scientific Working Group on DNA Analysis Methods "Revised Validation Guidelines: (July 10, 2003)" (Forensic Science Communications July 2004, V. 6, No.3). These studies specifically addressed sensitivity, stability, reproducibility, precision, and accuracy. In each instance the Identifiler® kit produced with the updated manufacturing steps performed comparably to the previous Identifiler® kit.

These minor modifications to the manufacturing process of the Identifiler® Kit, which were introduced in response to customer feedback, either significantly reduced or eliminated the observed reproducible artifacts. This facilitates the use of the Identifiler® kit for forensic casework involving mixed specimen samples and has led to an overall increase in customer satisfaction.

STR, Genotyping, Identifiler®

D52 Postmortem Multi-Slice Computed Tomography of Laryngeal Lesions: Forensic Applications

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The goal of this presentation is to provide a description of postmortem laryngeal lesions diagnosed by multi-slice computed tomography. This presentation will impact the forensic community and/or humanity by providing an example of routine application of the multi-slice computed tomography in forensic sciences.

Background: Multi-slice computed tomography (MSCT) is uncommonly used in forensic pathology. This imaging technique was recently improved by technological innovations and has become an essential tool in the management of many pathologies. MSCT allows two or three-dimensional reconstructions, which can be helpful in traumatic pathologies.

Purpose: To evaluate the possible role of MSCT and elaborate a new imaging semeiology in forensic evaluation of laryngeal lesions.

Technique: Thirty-three forensic cases with laryngeal lesions were examined with a sixteen-detector rows CT (Sensation 16, Siemens). Manners of death studied were homicide, suicide, and accident. Anonymity of the deceased was preserved by wrapping corpses in two radiologically artefact-free body bags. Two-and three-dimensional post-processing (SSD (Surface Shaded Display) or VRT (Volume Rendering Technique)) were made in all cases. Image interpretation and reconstruction were performed by board-certified neuroradiologists and radiologists. In 22 cases, findings were verified by autopsy made by board-certified forensic pathologists who were blinded to image results. All three body cavities (cranium, thorax and abdomen) were examined. All these autopsies were made because of a judiciary decision. A retrospective correlation between imaging and autopsy results was performed in order to improve postmortem-imaging semeiology.

Results: Eight cases of laryngeal traumatism were diagnosed. Causes of death in those cases were suicidal hanging (n=6 cases), suicidal gunshot wound (n=1 case) and accidental motor vehicle accident (n=1 case).

Different laryngeal abnormalities were found: fractures of both thyroid cartilage laminae, isolated fracture of one superior thyroid cartilage horn (distal or inferior thirds of the superior horn), isolated hyoid fracture of one greater horn, isolated luxation between one greater horn and hyoid body, combined fractures of the hyoid bone and thyroid cartilage. No fractures of the cricoid cartilage, or cervical spine were demonstrated.

Forensic vital signs such as air embolism, subcutaneous emphysema, haemorrhage at fractures sites, and pulmonary aspiration were diagnosed.

Radiological pitfalls were encountered; some of them can be misinterpreted as fractures or laryngeal lesions and consequently have to be known by radiologists. The synchondrosis between the greater horn and the body of the hyoid bone may easily simulate a fracture. The heterogeneous calcification of the thyroid cartilage may mimic a lamina fracture. The incomplete and heterogeneous calcification of posterior extremities of the greater hyoid horns may also simulate a fracture. Cartilago triticea are potentially confusing points that may encounter in the assessment of possible fractures of neck structures. They may undergo calcification or ossification and may simulate fractures of the upper ends of the superior cornua of the thyroid cartilage.

Three-dimensional reconstructions were helpful, especially in cases of anatomical variations. One variation in the anatomy of the superior cornua of the thyroid cartilage was diagnosed: the bilateral medial deviation of the

superior cornua, which is known to increase throughout life. The authors found a case of stylo-hyoid ligament calcification. Three-dimensional reconstructions are more useful than two dimensional in the assessment of laryngeal lesions and anatomical variation of the thyroid cartilage.

Conclusion: Autopsy is the gold standard examination for the determination of causes of death. Nevertheless, it seems that MSCT has a great potential in forensic sciences. It is much more sensitive than classical X-rays in the diagnosis of bone or cartilaginous traumatic lesions. Furthermore, it allows a non-traumatic diagnosis of soft tissues and organs lesions, with no risk of lesions destruction. Even if it is not question of substitution, MSCT must be considered as a complementary technique, as far as it is performed by a radiologist with a good knowledge of medicolegal issues.

Computed Tomography, Postmortem, Larynx

D53 A Computer Program for Calculating Forensic Population Study Parameters of STR Loci

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The goal of this presentation is to provide a program to help calculate a wide range of forensic population parameters and a FPP (false positive parentage) rate. This presentation will impact the forensic community and/or humanity by making the population study more efficient and provide an easy way to evaluate the false positive parentage rate to avoid false identification, especially for DNA database operation.

The computer program (STRstatistics 2005.1) is presented, which is capable of calculating a wide range of commonly used forensic population study parameters. These include: p value of G-tests for HWE proportion; the number of types of a particular allele; the occurrence frequency of alleles, expected and observed heterozygosity (H); polymorphism information content (PIC); power of discrimination (PD); probability of a match (PM); power of exclusion (PE) for trio and duo paternity tests; typical paternity index (PI_t) and typical power of exclusion (PE_t). The evaluation of data by these means is frequently a requirement in forensic practice, particularly when examining a new population.

At present, there are limitations to the computer programs that are available for forensic population studies, such as locus by locus handling (rather than batch handling), limited sample volume, and data format transformation. Many other genetic processing related computer programs were not designed exclusively for forensic evaluation of population study and therefore only provide analysis for a few forensic population parameters, therefore requiring additional calculation tools to be used. The STRstatistics 2005.1 program runs on the basis of the initial STR data such as that directly imported from Applied Biosystems Genotyper® software as well as an Excel format or by manual addition. Microsoft® Excel® Macros and built-in functions controlled by Visual Basic language written by the authors was used to handle the Hardy-Weingberg test and other forensic calculations. The application requires only that the users post or import their 15 STR genotypes from a population onto a Microsoft® Excel® worksheet, then press the hot key to activate the Macros. The allele frequency and forensic parameter table will be generated ready for publishing or for use as a population database. The program is capable of handling data of 1,000 individuals and 15 loci simultaneously, from which the informative forensic parameters will be tabulated automatically. The "STRstatistics 2005.1" Microsoft® Excel® template contains several worksheets. The "ori STR" worksheet provides brief instructions for using the template, and describes some limitations of the template. The genotype data for 15 STR loci, which comprises 30 columns with 2 columns for each locus, may be pasted onto the "ori STR" worksheet. Up to 40 alleles for

each locus are acceptable. Genotypes containing text alleles (e.g., nc or 9.x) or with more than 2 alleles will be treated as in text (nonnumeric) mode and ignored in the auto-run program analyses. The final results table is produced as “publish tab” but can be modified manually by users to meet the required formats for publication. The program is freely available to any forensic scientist interested. Please e-mail requests to the corresponding author.

Forensic Science, STRs, Population Study

D54 Justice Delayed But Not Denied - The Evidence Solved the Case

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Attendees will gain a greater understanding of the importance of the proper preservation and secure custody of items that may someday be evidence in violent crime investigations, even many years later.

This presentation will impact the forensic community and/or humanity by providing a greater understanding of the value of teamwork between the many disciplines that work together to solve cases and prosecute the guilty, as well as offer hope to those who seek justice.

Like many young people in New Zealand, Sandra wanted to travel abroad before she settled down in her career as a nurse. She started out on her solo trip in the state of Virginia then hitchhiked to Panama City, Florida. Her next destination was to be a youth hostel in New Orleans where she would renew her visa then travel to Colorado. She rose early on November 10, 1981, packed her belongings and walked to the highway to hitch a ride. She was picked up quickly by a black male in his 30s. Sandra was not familiar with the dangers of hitchhiking and did not realize they were headed in the wrong direction. The man turned off of the interstate in a rural area in Leon County and told her he wanted to drop off a package at a friend's house. Sandra asked him to stop the car so she could stay near the highway to get another ride. He kept driving and assured her it would be a quick stop. He turned down the first road he came to and appeared to be looking for an address. When he got to the end of the road, he turned around and drove his car deep into a wooded area. It quickly became clear that the subject intended to rape her. She tried to resist and escape but she was struck repeatedly. After the sexual assault, the subject tried to strangle her with the straps of her overalls. The last thing she remembered was kicking the windshield with her foot and seeing it crack. When she woke up, she was alone and bleeding. A broken tree limb and a cement slab that was covered with her blood were lying next to her head. She held her hands over her bleeding face and managed to make it more than 600 feet back to the road. A passing car slowed down and the driver said he would go and call the sheriff. The deputies and paramedics arrived quickly and the victim was transported to the hospital. The author was summoned as the lead detective was told the victim was probably not going to make it. Hinman was directed to go to the hospital and get as much information as possible before she died. An experienced detective is used to seeing horrible injuries but this case was different, the victim was alive. Her face appeared to be broken in half and most of her teeth were smashed off at the gums, but she was awake and she was talking.

In the days that followed the attack, the author returned to the hospital to question Sandra on a daily basis, but there was little more she could tell. When Sandra left for New Zealand all the only evidence was a composite of the offender, a positive identification from an automobile book that the car was an Oldsmobile, Tornado and several bags containing evidence of the crime.

Eventually, all leads went cold. As the years passed, the author

thought often of the New Zealand girl. As the author's advanced career, Hinman wondered whether scientific advancements and/or additional subsequent training and experience could be used to solve her case. It was believed that the offender would most likely commit other violent crimes.

Fortunately, the original crime scene investigation had been thorough and the evidence documented and preserved. Knowing the recent enhancements in DNA technology and Databases, the crime scene evidence was transferred to the FDLE crime lab for reexamination, in October 1999, 17 years after the crime had been committed and before DNA analysis was available to Law Enforcement. It was not surprising when Mr. Dave Coffman, the DNA Database supervisor for FDLE notified the author that a CODIS hit had identified Willie Oliver as a DNA match to the evidence that was submitted for the New Zealand girl. Further investigation tied Oliver to the crime, supporting the DNA identification.

Through the professionalism, hard work, and dedication of everyone involved in every stage of this investigation, Willie Oliver was finally successfully prosecuted and convicted by a jury of his peers in Tallahassee in July 2004.

Violent Crime, Profiling, DNA Database

D55 Predictive Interdiction Analysis on the Southwest Border of the United States

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After attending this presentation, attendees will have an understanding of the current methods and techniques used by the United States Border Patrol in their mission to safeguard America's frontline. Attendees will also be introduced to innovative computer programs that enable agents to do their job more efficiently.

This presentation will impact the forensic community and/or humanity by demonstrating the use of geospatial technology to predict interdiction points and routes used by alien smugglers after a border incursion.

The International Border that separates the United States from Mexico has long been a conduit of illegal activity into the United States. In the wake of 9/11, directors and decision makers have explored ways to control the daily influx of undocumented aliens seeking passage into the United States. This research study examines the operational use of Geographic Information Systems and computer-aided tracking systems to thwart future incursions through our borders. This study develops a terrain analysis model, which is integrated with the Border Patrol's Sensor System. The Geographic Information System then predicts the travel times and routes used by alien smugglers based on the terrain analysis model and preexisting trail structure.

Undocumented Aliens, GIS, U.S. Border Patrol

D56 They Would Have Survived With Fastened Seat Belts! Should Restraint Systems be Installed in Minibuses and Coaches?

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Attendees will be presented with results of the examination of this accident in question as well as the studies of Schuller, who examined the injuries caused by passengers who were thrown against victims sitting in front of them. This presentation will emphasize the demand for restraint systems in minibuses and coaches.

Every year, especially during winter or summer holiday, bus accidents are the subject of newspaper headlines in Europe. Although bus accidents are rare, they attract the interest of many people because often many

victims are to be deplored.

Year by year security standards of minibuses and coaches as well as the qualification of bus drivers are discussed. In the European community the absence of standardization of technical equipment in busses and training of bus drivers are deplorable. For this reason the *Commission of the European Communities* presented a "Proposal for a directive of the European Parliament and of the Council" to increase the security of minibuses and coaches. In all member states of the European Community, passenger cars have to be provided with restraint systems, whereas, the installation of these systems in minibuses and coaches is only required by law in a few member states.

The requirement for obligatory use of safety belts in all vehicles is based on studies of "ECBOS" (*ECBOS, Enhanced coach and Bus Occupant Safety* - <http://www.dsd.at/data/home.htm>). ECBOS found out, that "annually, an average of 150 passengers travelling in coaches and minibuses are killed and more than 30,000 persons are injured in road accidents throughout the European Union."

The majority of mechanisms leading to fatal injuries were:

- Passengers were thrown around within the confines of the vehicle.
- Passengers were ejected from the vehicle through broken windows.

In summer 2003 the circumstances of a bus accident on the "Autobahn" near Halle were examined. In the early morning in August 2003 the bus drifted slowly to the right side, broke the guardrail of the autobahn, overturned on the side and slipped 200m. Although the confine of the bus was not seriously distorted five passengers (two teenagers and three senior citizens) died at the scene of the accident and 19 victims (including the bus driver) were seriously injured.

The autopsy performed in the Institute of Forensic Medicine lead to the following results:

- Three passengers died of suffocation caused by thorax compression, two passengers died of intrathoracic hemorrhage, one in combination with rupture of the brain stem.
- Damage to the clothes as well as abrasions of the skin of the victims proved, that the victims were ejected from the vehicle and overrun by the sliding bus.
- They all could have survived this accident with fastened seat belts.

These results as well as the studies of Schuller place emphasis on the demand for restraint systems in minibuses and coaches.

Restraint Systems, Busses, Thorax Compression

D57 Complete and Partial Decapitations in Suicidal Hangings: Two New Cases

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After attending this presentation, attendees will understand that suicidal hanging is one of the most common methods used in masculine suicides and the second one for women. In a few rare cases, hanging leads to a beheading. Two new cases are presented to illustrate this rare eventuality.

This presentation will impact the forensic community and/or humanity by reviewing literature, which demonstrates that hanging / beheading is exceptional. The promoting factors would be falls from high points, complete hangings, use of thin stretchable links and heavier bodies. These circumstances are rare, and in the authors' opinion an autopsy should be systematically performed to assess the forensic context.

First case (Clermont-Ferrand): the body of a 57-years-old man was found near a railroad, beheaded after a precipitation from a high bridge owned by the French railway society. The height was estimated from 8.80 meters to 10 meters; the weight of the body was about 80 kg. The subject is suspected to have jumped off the bridge with a twined nylon rope tied up around his neck. This rope was 5 meters long and 1.6 cm large. The head and his body were separated from a distance of about 1 m. They were both found under the bridge surrounded by multiple tracks of blood on both ground and walls.

The autopsy showed two different edges of section (head and neck) separated by a left circular abrasion in relation to the rope stretch. The position of the knot and its progression towards the head were clarified by investigations. Nylon fibers found on both sides of sections were strictly identical to those belonging to the link.

Second case (Montpellier): the body of a 35-years-old man with a thin corpulence was found hanged to a beam situated 3 meters from the ground; the feet were hardly touching the ground. In the surroundings, no suspect evidences were found to assess a criminal hanging. After having taking the body down, it turned out that the cephalic extremity was quite close to being removed from the body. It was shown that the head was still connected to the body by some posterior muscles of the neck. The examination found no traces of violence. The autopsy revealed signs of gaseous embolism, signing the vital origin of the beheading. The section of the cervical wound found very fine lines corresponding exactly to the distance between the different strands of the rope, confirming its action during hanging.

Beheading, Hanging, Suicide

D58 Hanging by a Hair: Animal-Derived Trace Evidence in Criminal Investigations

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The goal of this presentation is to build awareness in the forensic community that animal-derived trace evidence can play a significant role in criminal investigation. Identification of individual animals with animal hairs, using DNA tools and databases existing today, can show a compelling link between a victim and a suspect.

Pets are ubiquitous and leave their biological traces everywhere. This presentation will impact the forensic community and/or humanity by raising awareness of the power of new methods for identification and hence broaden the tools for the investigation of crime scenes. Rather than presenting this talk in the DNA section, it is important that the first and second responders to a crime scene (crime scene teams and trace evidence examiners) hear about these cases firsthand.

Microscopic examination has long been the only tool for establishing a "match" for animal hairs found at crime scenes. DNA identification of hairs, using microsatellites and mitochondrial DNA, provides more precise identification and may be useful in linking a suspect to a victim or crime scene.

Animal hair from pets is a common finding in crime scene investigations. In the cases described, observant investigators collected animal hairs as evidence. Matching those hairs to the pet of the suspect or victim, however, required specialized analysis. The physical similarity of animal hairs, while useful, is often not conclusive. Hairs from the same dog or cat can vary depending on hair type (guard or fur hair) and body location. DNA analysis of animal hairs provides a more accurate means of identification and, using DNA information databases, provides an estimate of the significance of a DNA match. Like humans, animal hairs can be tested with species-specific microsatellites and mitochondrial analysis (Mt haplotyping). The following cases are examples of mitochondrial typing of

animal hair trace evidence:

In 2002, 8-year-old Danielle van Dam was abducted from her home in San Diego. Her body was recovered days later in a remote area. The police suspected the van Dam's neighbor, David Westerfeld, and searched his home and motor home, where they thought Danielle was murdered. Among other important evidence, investigators collected short dog hairs on the carpet of the motor home and in the lint trap of Westerfeld's dryer. The hairs were a violet-hued gray, a color unique to the Weimeraner dog breed. The van Dam's owned a Weimeraner dog, and indicated that Danielle frequently cuddled with the dog before bedtime. A DNA match, using mitochondrial analysis, was found between the van Dam's dog and the hairs from the alleged crime scene. Although the mitochondrial haplotype was fairly common (9%), the findings did not exclude Westerfeld as a suspect and aided prosecutors in their case.

In 1987, 10-year-old Amy Schulz of Jefferson County, Illinois was abducted, brutally sexually assaulted, and murdered. A number of black dog hairs were recovered from Amy's clothing as well as a single human pubic hair. Cecil Sutherland, a resident in the town, was later arrested. Sutherland owned a black Labrador Retriever. The hair evidence could not be used, as the DNA techniques available at the time required other sample types. Sutherland was convicted of Amy's murder in 1989 but the conviction was overturned. In 2003, prosecutors re-opened the case and mitochondrial analysis was performed on the human hair and the dog hairs. The DNA from the human hair included Cecil Sutherland and the DNA from the dog hairs included his dog. In June 2004, Cecil Sutherland was convicted of first-degree murder a second time and requested the death penalty.

In crime between strangers or non-family members, such as abductions, the utility of animal hairs as evidence should be obvious. However, important animal-derived evidence may be found even in crimes between acquaintances or family members. In 2002, Andrew Rich pleaded guilty to voluntary manslaughter of a friend, John Helbe in Johnson County, Iowa. Rich had stolen an ammunition box from Helbe and, when found by police, it contained a single dog hair matching a dog owned by Helbe. Compelled to account for possessing his friend's ammunition box, he plea-bargained.

For years, trace evidence examiners have relied on the microscopic similarity of animal hairs to use them as evidence. DNA typing of hairs opens new possibilities for linking suspects to crime scenes or victims. Pets can be identified, occasionally with the precision provided by microsatellite testing. Although mitochondrial typing cannot be used as a unique identifier, a mitochondrial inclusion can be valuable in developing a case or as "another piece of the puzzle" at trial. Pets leave hair everywhere; it is up to investigators to evaluate its relevance and shape its significance with appropriate questions. Trace evidence examiners should assist their crime scene teams by raising awareness of this new evidence resource.

Animal Hair, Trace Evidence, DNA Typing

D59 New Developments From the National Clearinghouse for Science, Technology, and the Law

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Attendees will gain knowledge of the forensic science information resource guide compiled by the Clearinghouse, as well as numerous continuing education tools and training materials the Clearinghouse is working on.

This presentation will impact the forensic community and/or

humanity by informing the forensic community of the current (and future) projects at the National Clearinghouse for Science, Technology, and Law so they can become involved in ongoing continuing education and training and utilize the existing resource guide and reference collection as appropriate.

New challenges for expert witnesses and the legal community have arisen due to recent developments in science and technology. New technologies and methodologies, as well as fields long considered established, such as latent print identification and tool marks are facing increased scrutiny. Given this explosion of scientific evidence litigation, scientists, law enforcement, laboratory personnel, judges, and lawyers are overwhelmed by the amount of information required to educate them to meet these legal challenges.

Until now, judges, lawyers, scientists, and law enforcement personnel did not have one source that allowed them to navigate all the existing case law, journals, reports, proceedings, and other resources necessary to conduct effective investigations and litigation. The *Resource Guide for Users of Science and Technology* was created to fill an information need specifically relating to legal issues implicated by the use of new technology in criminal and civil justice. Supported by a joint cooperative agreement between the NFSTC and NIJ (#2000-RC-CX-K001), the project developed a comprehensive searchable database from a variety of sources covering a wide range of topics. The database provides information on topics such as bloodstain pattern analysis, body scans/retinal scans, digital image enhancement, entomology, expert witness malpractice, fingerprints, questioned documents, smart cards, trace evidence, and tool marks. The Resource Guide covers existing court rulings, pending court cases, scientific and legal articles from applicable sources, relevant information from books, current and pending legislation, conference proceedings, university and continuing education courses, and pronouncements from professional organizations. The NFSTC/NIJ project produced a searchable CD. The information contained in the Resource Guide will be included in and expanded upon in the online resource being developed by the National Clearinghouse on Science, Technology and the Law at Stetson University College of Law. The Clearinghouse is supported by a grant from the National Institute of Justice (#2003-IJ-CX-K024).

In addition to the development of the online resource, the Clearinghouse is building partnerships with law schools, professional associations, and federal agencies, sponsoring a forensic science/science and technology seminar series, convening Community Acceptance panels at the request of NIJ, sponsoring the National Conference on Science, Technology and the Law with various forensic science and legal organizations, developing training modules with an emphasis on distance education, and building a reference collection of law, science and technology literature available through interlibrary loan to other institutions.

Science, Technology, Law

D60 A New Method to Assist in the Rapid Identification of Unknown Bodies Utilizing a Nationwide Database of Specialized Forensic Data

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The goal of this presentation is to familiarize the non-dentist attendee with a new computer program to assist in the rapid identification of unknown bodies utilizing a nationwide database forensic data. The attendees will be introduced to a client/server-based system that securely links to a national database of forensic odontological data to assist in possible identification.

Following this presentation the attendee will understand the model for

establishing and linking multiple law enforcement institutions to access and utilize forensic odontological data and the importance of collecting this data during a missing persons or unknown body forensic investigation.

The linking of local forensic databases to a national or international database has created a powerful tool in the rapid identification of unknown bodies. Database of fingerprint or DNA information has matured over the last 20 years and have provided invaluable in assisting in this identification. Unfortunately, both have some severe limitations. Fingerprints require that fingers are present and that the body has not decayed to the point of making the print unreadable. DNA information is far more reliable but is limited by the difficulty in creating an antemortem or postmortem database and currently requires a specialized laboratory and far more time to perform reliably. Forensic odontological data is easy to obtain and easy to utilize but there is currently no available system that can link local officials to a national or international database.

Dr. James McGivney's WinID8 dental identification program has been the gold standard used by forensic odontologists for many years for mass disaster. Its usefulness has been well documented but is limited to local crime scenes. Query Analyzer for WinID8 (QA For WinID8) has been designed from the ground up as a client/server based system to selectively match local data to a national or international database allowing for the creation of worldwide clearinghouse for forensic data. Its algorithms make extensive use of the filters, which in computer jargon are referred to as queries, and are designed to reduce the number of possible matches by eliminating "unexplainable discrepancies." Because of the universality of the Standard Query Language (SQL), the method QA for WinID8 uses to filter information, it allows for an easy method to bridge with other database programs. This filtering is done automatically by QA For WinID8 and therefore does not require any knowledge of the SQL.

The purpose of this presentation is to familiarize the non-dentist in the use of this program and to aid them in setting up a nationwide database of odontologic data. It will describe a mechanism whereby local law enforcement agencies will have the capability to attempt to find possible matches of unknown bodies or missing persons with antemortem information against a national database. Finally by presenting this lecture in the General Section it will emphasize the importance of obtaining this information as standard operating procedure when local law enforcement officials collect evidence for a missing person or when attempting to identify an unknown body.

Computer Program, Forensic Identification, Mass Disasters

D61 Development of a Child Fatality Review Database for Maryland: A Practical Application of Forensic Medicine and Public Health Partnership

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After attending this presentation, attendees will understand the rationale for and methods employed by a forensic medicine-public health partnership in developing a statewide child fatality review database.

This presentation will impact the forensic community and/or humanity by helping members of the forensic community recognize the importance of their professional contributions to CFR as well as the benefits of using partnerships to create data systems and data sharing opportunities.

Multidisciplinary child fatality review (CFR) teams can make important contributions to understanding of sudden and unexpected child deaths, and aid efforts to prevent both unintentional (*accidental*) and intentional child injury (child abuse, shaken baby syndrome, etc).

Although medical examiners and forensic investigators frequently contribute information and make valuable professional contributions to CFR teams, they have been slow to assume an advisory or coordinating role in the initiative. In Maryland, which has a statewide medical examiner system and an unfunded legislative mandate to establish CFR teams in all counties, the potential of partnership to enhance the quality of data available to CFR teams is being explored. This presentation will discuss the conceptual development and structure of the database.

Although much attention is paid to the development of data collection protocols for CFR, less attention has been given to the management, retrieval, and analysis of data. The quality, timeliness and accessibility of data determine their utility for systems improvement and development of prevention efforts (including policy). In developing a data system for Maryland, the State CFR Team and its Data Advisory Committee prioritized data content and data systems criteria. Data content criteria included: asking the right questions, identifying modifiable risk (and protective) factors, integration of multidisciplinary perspectives, data validation and completion, collection of CFR team management and decision making data, potential for analysis and application. Data system criteria included: protecting existence and sustainability of the database, limiting costs, limiting duplication of data collection, minimizing hardware and computer expertise required by each county, simplifying data sharing, maximizing potential to customize reports by county, data timeliness and protecting confidentiality.

The database is housed in the Office of the Chief Medical Examiner (OCME), because the partnership believed this to be the agency for which collection of high quality data on child death is a critical professional function. In addition, it is an agency that interacts on a regular basis with many agencies and organizations involved in child death investigation. OCME was in the process of building a new data system and had a strong record of partnership with public health and research organizations.

A core team was established to guide development of the database. This team includes the chief medical examiner; an assistant medical examiner with expertise in pediatric pathology, child abuse and CFR; the chief forensic investigator, a public health professional with expertise in CFR, injury prevention research, and policy development; a database development expert who is a Microsoft Certified Systems Engineer and active fire-fighter/EMT, and two graduate computer science students.

Database variables were developed using review of national CFR data recommendations, the literature on child death and injury, archived CFR case report materials, as well as state and local CFR team input. The database was created using a widely accepted standard of SQL Server (Microsoft Windows SQL). It utilizes a standard web-based client and a single-server base with multiple thin-net clients (who do not need individual hardware) to allow the counties of Maryland to access data for deaths occurring in their counties. For subpoena protection, the CFR database is a stand-alone component of the OCME data system. Case identification is in real-time but detailed OCME data (toxicology, autopsy findings, etc) are transferred into the CFR database later in the investigation. CFR teams may access these data during case reviews and are able to enter their additional review data directly into the CFR database. To facilitate use of data, pre-programmed child fatality reports - that can be customized for individual counties - are available as part of the database. To promote data accuracy and completion, extensive use is made of variable lists and directory trees. The database is designed to be user-friendly, and accessible via the internet, while addressing ethical challenges such as the preservation of confidentiality. Confidentiality is protected by using SQL authentication user-names and passwords; administrative protocols provide additional access control. The system is currently being pilot tested by a local CFR team in a large metropolitan county.

Database, Child Death, Partnership

D62 Alternate Light Source (ALS) for Examination of Stains on Multi-Colored

Textile

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After attending this presentation, attendees will understand the procedure for examining stained textiles with an alternate light source (ALS); understand the results of examining stained areas on dark multi-colored carpet; and understand the advantages and disadvantages of using an ALS to locate stains. This presentation will impact the forensic community and/or humanity by demonstrating to forensic scientists types of stains on textiles that are detectable using an alternate light source.

The purpose of this presentation is to present the results of an experiment that evaluated the use of an ALS for locating sixty stained areas on dark multi-colored carpet. The examination was conducted with both direct and oblique white light at 30 cm and five different wavelengths using a 400-watt ALS with direct illumination at distances of 10 cm (3.94 in), 20 cm (7.87 in), and 30 cm (11.81 in).

An important factor in conducting crime scene investigations is locating trace evidence. To facilitate searching for trace evidence, investigators use an ALS. Trace evidence, such as physiological stains, may be common on textiles. However, the investigator may also locate stains from other origins. Once a stain is located it may be collected, analyzed and identified.

Sample pieces of carpet measuring 91.44 cm (36 in) by 91.44 cm (36 in) were marked into grids 15.24 cm (6 in) by 15.24 cm (6 in) for staining. Sixty common products were selected to stain the carpet to determine their visibility with an ALS. Each section was stained and marked for identification with a known product. The stains were allowed to dry for two hours before testing and then separated into two groups for analysis. Thirty were food products and thirty were nonfood products. The detection levels were noted if the product absorbed or fluoresced light and made the stain visible.

The stains were illuminated with direct white light, oblique white light at 30 cm (11.81 in), 365 nm UV with no filter, 365 nm UV with yellow filter, 415 nm with orange filter, 415 nm with red filter, 445 nm with orange filter, 445 nm with red filter, 515 nm with orange filter, 515 nm with red filter, shortpass 540 nm with orange filter, and a shortpass 540 with red filter at three distances. The stains were examined at distances of 10 cm (3.94 in), 20 cm (7.87 in), and 30 cm (11.81 in).

Of the sixty stains examined, 25% (15) were visible in direct white light and 23% (14) were visible in white oblique lighting. Of the thirty food product stains examined, 40% (12) were visible in direct white light and 30% (9) were visible in white oblique light. Of the thirty nonfood product stains examined, 10% (3) were visible in direct white light and 16% (5) were visible in white oblique light. Considering the combination of light wavelengths and filters used to examine the sixty stains, the 365 nm UV light with no filter at a distance of 10 cm (3.94 in) and 20 cm (7.87 in) located the most stains. This combination located 26% (16) of the stains. Of the thirty food stains examined at a distance of 30 cm (11.81 in), no stains were visible with the following combination of light wavelengths and filters: 415 nm light with an orange filter, 415 nm light with a red filter, 515 nm light with an orange filter and a shortpass 540 nm light with a red filter.

In conclusion, of the sixty stains examined, 50% (30) that were not detected by direct or oblique lighting also were not detected by any combination of light wavelengths and filters. When separated into food and nonfood stain categories, 56% (17) of the food stains that were not detected by direct or oblique lighting also were not detected by any combination of light wavelengths and filters. 46% (14) of the nonfood stains that were not detected by direct or oblique lighting also were not detected by any combination of light wavelengths and filters. Therefore the 365 nm UV light with no filter at distances of 10 cm (3.94 in) and 20 cm (7.87 in) performed best in detecting non-physiological stains on multi-

colored carpet. Even though the ALS may be more preferable for locating physiological stains it can be useful in locating some food and nonfood product stains.

Alternate Light Source, Trace Evidence, Stains

D63 The Invisible Sentry: The Use of Radiation Imaging for Border Control

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After attending this presentation, attendees will understand security measurements with X-rays; technique, possibilities, and risks.

Security at airports, international borders, and government buildings are of general concern. Although measurements imposed may have consequences for individuals and society; they are little known. Techniques using ionizing radiation are explained. They are used with and without consent of the persons concerned. There is a conflict between the necessity of security on one hand, and the protection of privacy on the other. This presentation will impact the forensic community and/or humanity by informing the forensic community about new technical developments, their possibilities, problems, and risks.

At international borders and at internal control points, governmental control agencies are using x-ray and gamma rays to inspect and control not only persons, but also goods and the systems that transport them. Radiation systems employed range from conventional industrial x-rays through accelerators with 5 to 10 MeV energy through gamma ray units using sealed sources of cesium 137 or cobalt 60. Transmission (fluoroscopic) images and analysis of forward and backward radiation scatter are used. Transparency or fluoroscopy images show the object in question in superimposition upon its container and other contents. Computed tomography used for luggage inspection produces a digital image without superimposition. The identification of chemical components is possible by means of analysis of scatter radiation. The addition of a color palette by computer manipulation aids in identification of specific substances.

Explosives, transported in luggage or other carriers, can only be identified indirectly or suspected on transmission images. Double imaging or scatter systems, particularly if color can be added, can provide direct identification. Illegal transport of protected species can be detected by similar methods. Narcotics can be detected by radiologic inspection of luggage, where even a visual inspection might fail.

Sophisticated integrated systems for examining vehicles and their contents have been developed. Moving as well as stationary vehicles can be examined. Imaging systems for large vehicles and their contents have been developed elsewhere. Even China is producing a fluoroscopic system with a fixed detector and a movable source.

There are special restrictions and uses in some locations. In Germany exposure of food by x-rays or gamma rays is not allowed. The unit in the Port of Hamburg is operated so as to prevent the direct radiation exposure of people. Pamphlets and Internet information available from some manufacturers suggest they do not bother to prevent direct radiation exposure of human beings, such as truck drivers or passengers. Furthermore, the exposure of the equipment operator often is not discussed. New operators of the detection devices look for density where there should be voids, motion where there should be stillness, symmetry where there should be symmetry, and ominous silhouettes, particularly of weapons.

The body packer or mule smugglers carry drugs across borders in specially constructed packages to be carried hidden inside the body in the rectum, vagina or alimentary canal. The rectum and vagina are too easily accessible for search and discovery by manual means, so the alimentary canal has become the favored internal receptacle. The early drug packages were fairly primitive, using one or more layers of latex in the form of

condoms, the finger of surgical gloves, or even toy balloons. Almost inevitably air was trapped between the layers of the latex, and these telltale crescentic shadows were easily detected by routine radiography or fluoroscopy. Those early packages were also susceptible to rupture or leakage with sometimes fatal results.

Smuggling of contraband materials on the body rather than inside has required a pat-down strip search, or body search. The recent development of backscatter imaging provides an excellent method of hands-off body search for external contraband. This system is capable of detecting metals (inorganic) materials such as wires of a bomb, gun, blades, etc., and can also detect plastic (organic) materials such as explosives and drugs. The radiation dose is low, comparable to a few minutes flight at 30,000 ft. in a commercial aircraft. In the United States individuals are given a choice of simply standing in front of the imaging device fully clothed, or undergoing a pat-down (in either case conducted by a member of the same sex). The suspect must consent to the search by radiation. It is said never to be used in secret in the United States. In other countries, there are reports that similar devices are used on unsuspecting travellers.

X-Ray in Airport Security, Detection of Explosives, X-Ray Exposure D64 The Value of Comparison Mason Jars in Fire Debris Analysis

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Attendees will learn about the usefulness of comparison of mason jars in fire debris analysis. This presentation will impact the forensic community and/or humanity by demonstrating how routine analysis of comparison jars has provided this laboratory with a means for establishing background levels of ignitable liquids in Mason jars and a further context for understanding the significance of trace level identifications of ignitable liquids in case items.

The recommended packaging for fire debris at the Centre of Forensic Sciences is glass Mason jars. Since 1998, this laboratory has also recommended the submission of an unused comparison Mason jar for analysis to account for the storage and handling of the jars used to collect case items. A review of 651 cases from 2001 to 2003 was conducted to assess the usefulness of comparison Mason jars in headspace fire debris analysis.

An ignitable liquid was not identified in a comparison Mason jar above a trace level in any of the 651 cases reviewed. This laboratory defines a trace level as response greater than the analytical limit of detection (approximately 0.1µL of gasoline in a 1L glass Mason jar) and at a level near but above that of any background contributions from the debris material. A trace level of ignitable liquid vapor was identified in the comparison jar(s) of 57 cases (8.8%), including gasoline in 50 cases, medium petroleum distillate in 6 cases, and medium isoparaffinic product in 1 case. The percentage of cases in which a trace level of ignitable liquid was identified in a comparison jar has decreased over time from 13.7% in 2001, to 5.9% in 2002 and to 4.5% in 2003.

Cases were further reviewed when positive case item(s) (i.e., above trace) and a comparison jar were stored in the same box at the laboratory prior to analysis (146 of the 651 cases). This was done to address the possibility that trace levels of ignitable liquid vapors could cross-transfer between jars during storage. The comparison jar was negative in 105 of these cases, positive for the same class of ignitable liquid as the strongly positive item(s) in 39 cases, and positive for a different class of ignitable liquid than the strongly positive item(s) in 2 cases. In 16 of the remaining 505 cases, cross-transfer during storage at the laboratory could not account for the positive comparison jar result as it was stored in the same box as only negative case items and/or items in which only trace levels of ignitable liquids were identified.

Ignitable liquids were not identified in a comparison jar above a trace level in any of the 651 cases reviewed. Regardless of comparison jar

results, when an ignitable liquid is identified at a trace level in a case item at this laboratory, a cautionary note has routinely been included in the report. This note emphasizes to investigators and the courts that when an ignitable liquid is identified in a case item at a trace level, the possibility that it is unrelated to the cause and spread of the fire should be considered. Routine analysis of comparison jars has provided this laboratory with a means for establishing background levels of ignitable liquids in Mason jars and a further context for understanding the significance of trace level identifications of ignitable liquids in case items.

Fire Debris, Packaging, Comparison Mason Jars

D65 The Good, the Bad and the Ugly: Challenges Faced by the Forensic Clinical Nurse Specialist During the Evidence Collection Process

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This presentation will impact the forensic community and/or humanity by identifying deficiencies that often occur in the process of evidence collection. Such deficiencies could be resolved through education and effective communication between professional disciplines. Improved evidence collection practices could contribute to successful outcomes in forensic investigations.

After attending this presentation, the audience will understand the challenges of the forensic clinical nurse specialist during the evidence collection process. Evidence collection referred to herein will not focus on evidence collected following sexual assault but rather evidence gathered from sources of physical injury, accident, or altercation.

Saving a life is, unquestionably, the highest priority when treating victims who have sustained serious physical injury. However, once the victim is stabilized it is important that forensic nurse specialists extend the course of patient care, holistically, to include evidence collection and documentation as a standard of practice.

The role of the forensic clinical nurse specialist includes the recognition, collection, and preservation of forensic evidence. This responsibility, however, does not come without challenges and sometimes, conflict. The evidence collection process may be barred by unforeseeable circumstances, lack of education or training, and breakdown of communication between professional disciplines.

Training received by a forensic nurse specialist in basic evidence collection should include how to recognize, document, and package evidence as well as how to maintain the chain of custody of evidence until it is turned over to law enforcement officers involved in the investigation. Without such training and without open communication between law enforcement agencies and clinical professionals, evidence collection policies and procedures can become clouded and confusing. Keeping in mind that the purpose of evidence collection is to help to support the facts or to dispel a theory in the course of a forensic investigation, those involved in the evidence collection process must remain neutral in opinion and allow the evidence to stand on its own in a court of law.

Situations that surround the evidence collection process may be

considered by the forensic nurse specialist to be good, bad, or ugly. “Good” situations that enhance the evidence collection process would include treating the victim within a short period of time from the incident, eliciting an accurate account of information from the victim, using appropriate collection techniques, initiating and maintaining chain of custody, and recording clinical findings into the patient record. Having a forensic nurse specialist on staff in hospital emergency departments and trauma centers would positively result in desirable outcomes in the evidence collection process.

Evidence located within a reasonable period of time following an assault that is properly collected and preserved, would likely be in better condition for laboratory testing than evidence that was hastily collected or haphazardly stored. Further, laboratory examination and scientific interpretation of the properly secured evidence would provide useful findings for the investigation.

Situations considered as “bad” result in less desirable outcomes. Sometimes evidence may be cross contaminated or saturated by blood, bodily fluids, or other sources, making the evidence collection process more difficult. Environmental factors such as extreme heat, cold, humidity, rain, light, or darkness may also interfere with evidence preservation.

“Ugly” situations are the unfortunate circumstances that occur when evidence is present but not identified, preserved, or properly collected because of lack of training and resources. Untrained medical staff could unknowingly destroy, dispose of, or fail to collect evidence because they simply do not know how. Communication barriers between professional disciplines could add further “ugliness” to a case. Clinicians and law enforcement investigators need to work together and communicate about the desired evidence collection process. Understandably, law enforcement personnel are cautious about providing information about the crime scene while the investigation is ongoing. However, to work together effectively, it is necessary to agree upon evidence collection methods that are acceptable for each discipline and also for the laboratory that will be testing the items submitted.

In some jurisdictions, hospital staff may expect law enforcement officers to gather the evidence from the patient. In other jurisdictions, law enforcement may expect that the hospital staff will collect evidence ranging from victim’s clothing to samples of blood, glass fragments, or debris. In other venues, a technician from a forensic laboratory may be called upon to gather the evidence. The forensic nurse specialist’s role and qualifications, if not clearly defined and delineated, may be challenged by certain authorities rather than perceived as a resource.

The evidence collection process in the clinical setting will vary from one investigation to the next ...from the good to the bad to the ugly. This presentation will identify ways to avoid ugly situations and discuss how to address the challenges faced by the Forensic Clinical Nurse Specialist. Case studies will be highlighted as examples.

Forensic Nursing, Evidence Collection, Law Enforcement

D66 Rethinking “Injury at Work”: A Proposal for Revising Classification of the Occupational Contribution to Medicolegally Investigated Injury Deaths

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After attending this presentation, attendees will understand an alternative approach to classifying the contribution of occupational factors

to injury death. Application of this of this rubric will increase the specificity of medical examiner data and facilitate the epidemiologic investigation of injury death including the development and evaluation of effective prevention strategies.

This presentation will impact the forensic community and/or humanity by initiating a dialogue about the feasibility of its application as well as provide an opportunity for revision by those who would be implementing it on a widespread basis. It is a system that is intended to increase the sensitivity of medical examiner data to identify instances where occupational exposure may have contributed to an injury death beyond the current guidelines provided by NAPHSIS yet afford ME’s the ability to still complete the ‘Injury At Work’ on the death certificate. It is a tool for adding value to the data collected by medicolegal death investigation systems.

The National Association for Public Health Statistics and Information Systems (NAPHSIS) issues Operational Guidelines for Determination of Injury At Work. These are intended to facilitate the completion of the Injury At Work section of the Certificate of Death. Certain types of death are characterized as work-related and others are not. In contrast, the proposed rubric uses a graded approach to account for relative contribution of occupational factors to injury death.

Assessment of the contribution of work to an injury event is best viewed as a two-stage process. First, establish work-association using the ‘but for’ threshold test and then follow it with further gradation of the relationship. ‘But for’ means asking questions about antecedents ¾ the who, what, when, where, how and why’s of the medicolegal death investigation. If ‘but for’ being engaged work or work being the reason why one is exposed to the hazard (e.g., commuting), the individual would have avoided the exposure to that particular hazard, then the death or injury event is termed work-associated.

Within work-associated, further characterization of the relationship between the injury event and work can be made using these questions. Completion of the questions yields a grade of work-association for the injury event. Ultimately, Grades V and IV should be comparable to what is currently coded as OTJ on the death certificate using the NAPHSIS guidelines.

At the outset, identify if the physical location of the injury event is an employment setting for the decedent, regardless of whether or not it is the primary site of employment or that of a second job. Having made that assessment and in the context of the activity the decedent was engaged in at the time of death:

- 1) Was the site of onset the usual place of employment? If yes, death is OTJ Grade V if event occurs during normal/usual days/hours of operation and/or the employer has an obligation for occupational safety f no or unknown, proceed to next question.
- 2) Was the decedent engaged in his/her usual occupation (was she/he performing her/his usual duties)? If yes, then death is OTJ Grade IV (especially if the decedent is working for his/her employer and/or for fiscal gain). If no or unknown, proceed to next question.
- 3) Was the decedent engaged in ANY activity for fiscal gain or benefit? If yes, then OTJ Grade III (regardless of who is the beneficiary and whether the effort results in monetary benefit or in-kind assets). If no or unknown, proceed to next question.
- 4) Did his/her employer consider the decedent on ‘travel status’? If yes, then OTJ Grade II (regardless of the activity at the time of onset). If no or unknown, proceed to next question.
- 5) But for the nature/location of the decedent’s work (and/or his/her efforts to honor that responsibility), would she/he have been at risk for onset of the fatal event? If yes, then OTJ Grade I (as having to be in that location at the time of onset as a function of fulfilling job responsibilities makes the event work-related). If no, then the death is not OTJ or work-related. If unknown at this point, place case in the undetermined category for work-association.

Implementation of this schema would find application in the medical examiner investigation of fatal injury events. Specific training (usage guidance) would need to be provided to local medical examiners to ensure adequate application of the rubric. The assessment of work-relatedness should be made independent of the ascertainment of cause and manner of death. Moreover, the assignment of work-related status should be independent of any assessment of employer liability for death benefit compensation. The emphasis in developing and employing this alternative way of classifying the contribution of work to fatal injury should be on the identification of common risk factors, followed by the development, implementation and evaluation of preventive measures.

Occupational, Fatal Injury, Death Classification

D67 Danger of Cellular Phone and Autopsy in Case of Death by Lures

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The goal of this presentation is to expose the dangers of handling not struck and/or damaged explosives during external examination on the accident scene and during autopsy.

This presentation will impact the forensic community and/or humanity by demonstrating the necessity to be very prudent in case of external examination and/or autopsy when damaged or not struck ammunitions or others cartridges are present in the corpse or around the scene. Secondly, in such cases, it is important and necessary for an intervention following the bomb disposal expert. Finally, prudence should be practiced with cellular phones!

Case-Report: A case of a young soldier is presented who was found dead after an explosion. He worked in a French military base, and transported explosive ammunition and lures.

Suddenly, an explosion occurred. Part of the ammunition exploded followed by other explosions. The blast projected the body several meters high, and according to parabolic trajectory, of about thirty meters. During the external examination on site, we discovered the cephalic impact on the top of the hangar, five meters higher. The victim's cell phone was discovered near the accident scene. This was a very significant because, in these kinds of dangerous areas very sensitive to electromagnetic waves, any cellular phone is prohibited. After external examination, the corpse was transported to the Forensic Service for autopsy. During radiology at autopsy, many parts of the ammunitions (cartridges, shell...) were found. Although damaged, many were not struck cartridges. All these components were embedded in the corpse. The damage was very impressive. All of the organs were destroyed and in pieces. It took considerable time to remove all the ammunition! The toxicological analyses were negative.

Hypothesis of mechanisms: The different hypotheses are:

- The cellular phone was responsible for the first explosion (electromagnetic waves)
- A mechanical release by a fall from 1.5 m height (falls by awkwardness for example)
- The building which had a metal structure could play a part like an antenna (not like a Faraday cage) with a release by an electrical current
- The presence of a radio operator transmitter with strong power

(160 W) in the zone of the disaster

- The possible action of two radars which emitted in direction of the building.

The accident and consequences: The explosion of the ammunitions propelled the other ammunition that did not explode, but they were damaged, unstable, and very dangerous. They had become very sensitive to a shock, even the most insignificant.

They were also sensitive to electromagnetic waves, which happened to be emitting from cellular phones in the investigators' pockets during autopsy!

Discussion: In this case-report, different kinds of firing and the operating conditions of the terrestrial lures are discussed. These are responsible for the explosions because they started thermal and physics reactions in chain.

In cases of this type of "discovery," personal safety of the forensic pathologist, policeman, radiologist, and other laboratory personnel is essential. In the case reported, this could have been too late...because the team became aware of the dangerousness after the external examination and autopsy and after a literature revue!

Conclusion:

- The purpose of the case-report is to sensitize the medical and forensic pathologists about the dangerousness of cartridges and paradoxically and especially the lures, even without shocks, only, potentially, with a cellular phone
 - The intervention of bomb disposal experts is required in every suspicious case, before forensic intervention. Forensic intervention must take place as soon as the site is protected and made inoffensive.
 - Ammunitions must be handled with care
 - A good forensic pathologist is an a live pathologist...
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Lures, Autopsy, Safety

D68 Ethics for the Public Administrator: An Overview for the Forensic Professional

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Attendees will become familiar with the basic ethical expectations of public administrators operating in a city or county which adheres to principles of New Public Management, a current trend in public administration today.

This presentation will impact the forensic community and/or humanity by offering forensic professionals an overview of ethical standards drawn from the theories of new public management (NMP). Considering the popularity of NPM theories and practices amongst city, county, and state administrators, this presentation offers a working understanding and a vocabulary for forensic practitioners that are understood by their non-scientific governmental superiors and the public at large.

Although scientific expectations can be codified and standardized for the many professions recognized by the AAFS, the day to day ethics of these professionals as public administrators are often left vague and unspoken until a crisis arises. The purpose of this presentation is to offer an overview of ethical expectations for the forensic professional. Drawn from the wealth of literature on New Public Management—a currently popular trend in government practice today—a clear, concise, and accessible set of ethical expectations for the forensic administrator to draw upon in day-to-day administrative practice is offered.

Public Administration Ethics, New Public Management, Accountability

D69 Forensic Ethics: Getting Scientists and Lawyers on the Same Page

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After attending this presentation, attendees will understand some of the danger areas for scientists and lawyers to be aware of in cases, and ways to prevent ethical problems at trial.

Often, lawyers and scientists approach cases from different perspectives. They also each have their own independent scope of knowledge. Scientists can be caught between the prosecution and the defense, between the science and the law. This presentation will impact the forensic community and/or humanity by making scientists aware of their ethical duties and will examine how the lawyers can, and must, help the scientist carry out their ethical duties.

From 2002 through 2004, Sheri Mecklenburg was lead defense counsel on a series of cases involving reversed convictions, which alleged crime lab fraud in the old Chicago Police Crime Laboratory. Those cases generated headlines throughout the country and sent a shudder of concern throughout the legal and forensic communities. The lessons learned led to an examination of the practices of Crime Labs across the country and to recommendations for improvements. But through the anatomy of the Crime lab cases, Ms. Mecklenburg was able to view the ethics of the prosecutors, defense counsel, and crime lab scientist. Ms. Mecklenburg had the rare experience of viewing the cases with 20/20 hindsight, of picking them apart to determine what went wrong, and of spending hours upon hours in depositions asking each of the players what they did and why they did it. Ms. Mecklenburg, who has previously conducted seminars on Crime Lab Ethics, will discuss the lessons learned and how the three key players in forensic evidence can and must "get on the same page."

Ethics, Lawyers, Scientists

D70 Discrimination of Dyed Fibers Using Raman Microspectroscopy for Forensic Analysis

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The goal of this presentation is to evaluate the potential of Raman microspectroscopy to discriminate between common fiber classes, fiber subclasses, and fiber dyes in a forensic setting.

This presentation will impact the forensic community and/or humanity by providing the ability to obtain discriminating Raman spectral data on mounted fibers, which will greatly improve the forensic scientist's capability to identify fibers that cannot be discriminated by other techniques or samples that cannot be re-mounted.

Fibers are commonly encountered as trace evidence in crimes involving personal contact, such as homicide, assault, or sexual offenses. The value of these fibers as evidence depends on the forensic scientist's ability to identify and discriminate different fibers. Typically, fibers are visually identified using polarized light microscopy (PLM), however various spectroscopic methods (e.g., UV-Vis, IR and Raman) have also been shown to be useful for fiber discrimination. Whereas PLM provides morphological and index of refraction information, spectroscopic measurements can provide more direct molecular information and in the case of IR and Raman, unique vibrational "signatures" can be obtained. Raman spectroscopy can potentially be used to determine the generic fiber class (e.g., cotton, acrylic, polyester, nylon), and gain information on the structures of the dyes present, without the need to remove the fiber from the mounting medium. In Raman analysis, the ability to use glass slides is a

tremendous advantage compared to IR, where the fiber must be removed, and remounted in a cell that is IR compatible. A disadvantage of Raman spectroscopy is that the relatively weak Raman signal can become easily overwhelmed by high backgrounds from thermal degradation products or sample fluorescence. The effect of high background signals can be minimized by either reducing the background or increasing the relative intensity of the Raman signal. Raman signals can sometimes be increased substantially by the use of resonance Raman spectroscopy (RRS) or surface-enhanced Raman scattering (SERS) techniques. Raman signal enhancements from 10^5 to 10^6 are often reported using these techniques, and still larger enhancements can be realized using the two together (SERRS). Both techniques have been used to generate enhanced Raman signals for fiber dyes alone, as well as dyes on fibers.

A study evaluating the potential of Raman microspectroscopy to discriminate between common fiber classes, sub-classes and fiber dyes in a forensic setting will be presented. The Raman spectra show features from the base fiber, the dyes on the fiber, and other fiber constituents such as TiO_2 , a delustering agent. The Raman spectra also show features due to mounting materials and so care must be taken in the selection of mounting adhesives, slides and cover slips.

Raman microspectroscopy is used to quantify TiO_2 levels in delustered polyamide fibers at concentrations from 0-7.1%. Issues of concern found in measurements of TiO_2 in textile fibers include particle spacing and the possibility of particle agglomeration, which can lead to large signal variations. Methods to alleviate this signal variation will be discussed. Depolarization ratios have also been measured for TiO_2 in polyamide fibers for the purpose of providing additional discriminating data. It was found that the depolarization ratios are affected by polarizing effects of the fibers themselves. Solutions to this issue will also be discussed.

Dye fluorescence can be a concern for many types due to the typically weak Raman signals. Also, degradation products can be produced by thermal- or photo-degradation of fiber dyes and can contribute to high background signals. We have found that degradation product background signals can be minimized through careful control of the laser power incident on the sample. In general longer-wavelength laser excitation also reduces background signals by reducing both direct fluorescence and laser-induced dye degradation. It has also been found that SERS and RRS can be used for many types of fiber dyes to obtain greatly enhanced Raman signals. The use of SERS, RRS and SERRS is being explored to measure both extracted dyes and dyed fibers directly. SERS is also useful in suppressing fluorescence as the metal surfaces typically used for SERS quench fluorescence for adsorbed dye molecules. SERS and RRS data will be shown for both dyes and dyes on fibers.

The intent of this paper is to evaluate Raman microspectroscopy for the identification of fibers and dyes of forensic interest. Raman spectroscopy has great potential to contribute to the forensic analysis of textile fibers. The ability to obtain Raman spectra on mounted fibers will greatly improve the ability to identify fibers that cannot be discriminated by other techniques such as FT-IR or samples that cannot be re-mounted.

Fibers, Raman Microspectroscopy, SERS

D71 Validation of the CI Print Macroscopic Chemical Imaging System for the Analysis of Latent Fingerprints

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After attending this presentation, attendees will learn about the validation research of the CI Print Macroscopic Chemical Imaging System (ChemImage Corporation, Pittsburgh, PA). How chemical imaging is applied to latent fingerprint visualization as well as the advantages of chemical imaging over conventional methods will also be discussed.

This presentation will impact the forensic community and/or humanity by improving detection and visualization of fingerprints to the forensic science community. Chemical Imaging is an evolving technology that provides this improvement.

This oral presentation will describe the research that ChemImage Corporation has put forth to develop and validate a cost effective macroscopic chemical imaging system for latent fingerprint analysis. The validation research focused on establishing the CI Print as a reliable technique for fingerprint imaging. The validation procedure included reproducibility studies, age degradation studies, substrate variation studies, chemical treatment studies and a glycine limit of detection study. These studies included both raw images and processed images. Every image was compared back to a set of known inked fingerprints from the donors to evaluate the possibility of artifacts or deleted minutiae. All samples imaged using chemical imaging techniques, were also imaged using a conventional method of fingerprint imaging (i.e., digital camera and single-barrier filter configuration).

Chemical Imaging is a validated technology that combines molecular spectroscopy and digital imaging to provide morphological, compositional and structural information of materials. Through the use of an electro-optical imaging spectrometer, images of latent fingerprints and other trace forensic evidence materials are recorded as a function of wavelength, generating a fully resolved spectrum unique to the material for each pixel location in the image. Advantages of chemical imaging over conventional methods include lower detection limits and increased contrast between the sample and the underlying background.

The CONDOR™ Macroscopic Chemical Imaging System is the predecessor to the CI Print system. The luminescence and visible absorbance chemical imaging modes of the Condor have been successfully applied to various treated and untreated fingerprint samples. Chemical imaging using the CONDOR has also been used to demonstrate increased contrast of fingerprints developed on difficult backgrounds such as those that are dark, uneven, fluorescent and/or multi-colored surfaces. The CONDOR has been a viable strategy for detecting the most challenging latent fingerprints when standard development methods fail, and has also proven useful for other forensic analyses, including biological stains, inks and gun shot residue.

ChemImage's CI Print is a modified version of the CONDOR Macroscopic Chemical Imaging System. It was developed using smaller and more cost effective components and is designed specifically for the use of latent fingerprint analysis. The CI Print can be used on both routine and difficult samples. A comparison of sensitivity and application specific parameters will be discussed to compare and contrast the CI Print and the CONDOR.

This validation study yielded promising results. The CI Print produced higher contrast fingerprint images than the conventional method. Also, improved detection limits of glycine were achieved using the CI Print system as compared to the conventional barrier filter method. Lastly, the specialized image processing software used with the CI Print system, ChemImage X-Pert™, produced images with higher fingerprint to substrate contrast than conventional methods when evaluated on difficult substrates. The CI Print Macroscopic Chemical Imaging System has been shown to be a valid method for the imaging of routine as well as difficult latent fingerprints.

Chemical Imaging, Fingerprints, Validation

D72 Trends in Phencyclidine (PCP):

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Attendees will become aware of the history and present situation concerning phencyclidine (PCP) production and use. Attendees will also be familiarized with analytical techniques that may be used to handle any future submissions.

Phencyclidine use is on the rise. This presentation will impact the forensic community and/or humanity by providing forensic scientists and law enforcement officers who may not have had previous experience with the dangerous nature of this drug, both in the laboratory and on the street.

PCP was originally developed as an anesthetic in the 1950s, but after a wave of extreme side effects, its use in humans was discontinued in 1965. In the late 1960s, PCP became available for use as a veterinary anesthetic under the trade name of Sernylan® and was placed in Schedule III of the Controlled Substances Act (CSA). With abuse on the rise, the variety of side effects encountered was disconcerting. In 1978, it was transferred to Schedule II of the CSA and manufacture of Sernylan® was discontinued. It has been documented that peak use occurred around 1979. Consequently, the Drug Enforcement Administration's (DEA) laboratory system saw an incredible surge in exhibits analyzed in the early to mid 1980s. In 1986, the laboratory system analyzed nearly 5,000 PCP exhibits. The overwhelming majority of these exhibits were collected in the Washington, D.C. area and forwarded to the Mid-Atlantic Laboratory for analysis. The Mid-Atlantic Laboratory continually received the majority of exhibits for the rest of the decade. They accounted for approximately 90% of the PCP exhibits submitted to DEA laboratories between 1982 and 1989.

In recent years, the abuse of PCP has increased. Recent emergency room surveys indicate PCP abuse is increasing with over 6000 admissions in 2001. The DEA laboratory system has seen a steady increase of PCP submissions. There has been a 40% annual average increase in submissions from 1998 to 2003. The Washington, D.C. area still accounts for over 80% of those submissions. According to the El Paso Intelligence Center (EPIC), seizure of clandestine PCP laboratories is also on the rise. From 1998 to 2003, 54 clandestine PCP laboratory seizures were reported with the majority being in the state of California.

This presentation will take a look at the history of PCP and examine recent trends to see if PCP is making a comeback to the levels that it attained in the 1980s. It will discuss synthesis routes that have been and are currently being used, i.e. Maddox method, via enamines, and analogue synthetics. Techniques being used by forensic chemists to analyze routine and non-routine samples will also be addressed. Finally, a case that made local headlines in Baltimore, Maryland will be evaluated. A very large-scale clandestine PCP laboratory was seized in November 2002. The laboratory had the capacity of producing over 1000 gallons of liquid PCP. This seizure reveals that large-scale production is still a distinct possibility.

Phencyclidine, Clandestine Laboratories, Synthesis

D73 The Truth Will Set You Free: Lessons From a Shaken Baby Case

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Attendees will gain an awareness of pitfalls in investigation alleged offences where the evidence is mainly medical. They will also gain an appreciation of ethical issues in such investigations.

The recounting of actual experience of the issues, dilemmas, and difficulties faced in such cases from the attorney's perspective will impact the forensic community and/or humanity by raising awareness and stimulate debate, thus improving the quality of investigation and

management by the professionals involved.

This paper presents the story of a trial where the evidence was almost exclusively forensic medical evidence from areas where research is active and “accepted” views are in a state of flux. It will be illustrated with material from the actual trial (some subject to Supreme Court permission).

The story is told from the perspective of the author, who was the defence lawyer in the trial, currently conducting research about juries and forensic evidence. The trial took place simultaneously with a public awareness campaign about “SBS,” and starkly highlighted ethical dilemmas and professional and personal issues for lawyers and scientists including:

1. The problems for lawyers in weeding out the prevalent junk science.
2. Whether a judge or jury can hope to evaluate opinions in fields such as paediatric neuropathology, toxicology, radiology, forensic pathology, haematology, and ophthalmology.
3. The difficulty some scientists have in remaining objective in this field.
4. The uneasy co-existence of investigative and treating roles of hospitals.
5. The enormous responsibility for scientists in providing reports in areas where research is active and they may or may not be “up to speed,” especially where police may be unable to make an independent judgment as to whether to charge a person with murder due to the highly technical nature of the evidence.
6. What happens when an expert changes his or her mind between arrest and trial?

The paper encourages a consideration of the ethical issues for lawyers, scientists, and police in such cases and proposes approaches, which may help to avoid injustice and increase confidence in verdicts.

SBS, Ethics, Investigation

D74 Forensic Evaluation of Toxic Mold Claims

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After attending this presentation, attendees will understand the science and controversies regarding mold related illness. This presentation will impact the forensic community and/or humanity by educating attorneys, physicians, psychologists, claims examiners and industrial hygienists regarding toxic mold claims.

Participants will learn about the growing “toxic mold industry.” They will learn how to evaluate from medical, toxicologic, and neuropsychiatric aspects of toxic mold claims. The connection between claims of mold related illness to other forms of abnormal illness behavior, and syndromes such as multiple chemical sensitivity, sick building /new building, fibromyalgia, and chronic fatigue will be addressed.

Mold spores are present in all indoor and outdoor environments and cannot be eliminated. Of more than 50,000 species of fungi, only about 150 are known to be human pathogens. While mold mycotoxins can cause mucosal irritation, there is no clear evidence of chronic, nonmucosal pathology in human beings, even in water-damaged buildings. Mold related litigation is described as “the next big thing” after asbestos.

Between 1999 and 2001, there has been a thousand-fold increase in toxic mold-related insurance claims. A query on Google showed 114,000 hits for the term “Toxic Mold Neuropsychiatric.” These key words showed zero hits on Psych info and Medline.

A third of the 600 million dollar homeowner claims paid out by Farmers Insurance in the state of Texas over the past two years was mold related. California became the first state in the nation to legislate mold-related regulations, i.e., the Toxic Mold Protection Act, SB732, 2001. The magnitude of payouts have led to major insurance companies excluding

coverage for mold related damage

Though sometimes serious, physical illness in toxic mold claims is often of short duration. Attorneys and doctors with high profile toxic mold practices often emphasize neuropsychiatric claims of disability and suffering from physical problems. This is especially true when there are a few robust findings on laboratory and physical examination. Allegations of brain damage are made on the basis of nonreplicable anecdotal and idiosyncratic interpretation of technologies, such as SPECT, PET, and neuropsychological testing that often do not meet Daubert Standards. Body fluids are often sent for expensive and obscure tests. Findings of illness and disability may not be substantiated by face-to-face examination, the patient’s account of day-to-day functioning, on independent psychological testing, as well as by reviewing prior medical records and depositions. There is often evidence of pre-existing and concurrent factors, unrelated to the mold exposure in these individuals. Dr. Arora will cover key points in the medical examination. Dr. Jain will discuss the toxicology of mold mycotoxins and factors in the physical and laboratory examination. Dr. Nair will present the steps in the psychological/psychiatric examination, and review of records. Controversies in psychological/neuropsychological testing and neuroimaging findings will be discussed.

Attorneys, toxicologists, occupational environmental medicine, and mental health professionals who conduct Independent Medical and Psychiatric Examinations will benefit from this workshop.

Toxic, Illness Behavior, Mold

D75 Alternate Testing Procedures for the Modified Griess Test

James A. Bailey, PhD; Ruby S. Casanova, and Kimberly Bufkin, Cape Fear Community College, 411 North Front Street, Wilmington, NC 28401*

After attending this presentation, attendees will understand: (1) the procedure for conducting a modified Griess test for enhancing gun shot residue (GSR) powder patterns; understand the results of altering five testing procedures on three types of fabric; and understand the advantages and disadvantages of the altered procedures to enhance visualization of powder patterns. The purpose of this presentation is to present the results of an experiment that evaluated the modified Griess test procedure and five changes in the testing procedure on three types of fabric for GSR powder patterns at specific distances.

This presentation will impact the forensic community and/or humanity by aiding the forensic community in understanding GSR pattern testing procedures and alternatives for conducting the modified Griess test.

A model 686 .357 S&W revolver, with a 4-inch barrel was used to produce GSR patterns by firing .38 caliber Winchester ammunition with 150 grain lead round nose bullets into samples of 100% cotton, a blend of 65% cotton and 35% polyester and 100% polyester. All of the samples were white in color to enhance the comparison of the size of the pattern on the cloth to the modified Griess pattern on photographic paper. All samples were shot at a distance of 6 inches from muzzle to target.

The materials prepared for the modified Griess test included 12 sheets of 203 x 254 mm (8 x 10 in) Agfa multi-contrast double weight fiber base paper and 6 sheets of Kodak polycontrast RC (resin coated), type F photographic paper. Both papers were fixed with Kodak fixer for 10 minutes at 20°C (68°F). After fixing, it was washed in 20°C (68°F) water for 10 minutes and dried. The fiber base paper was air-dried and the RC paper was dried in an RC dryer. The desensitized photographic paper was then immersed in a chemical mixture. The mixture was prepared in two parts. Part one was prepared by adding 0.5 grams of sulfanilic acid in 100 milliliters of distilled water. Part two was prepared by adding 0.28 grams of alpha-naphthol in 100 milliliters of methanol. The two parts were mixed and the desensitized paper was immersed for 1 minute and dried at 20°C (68°F).

Eighteen pieces of 203 x 254 mm (8 x 10 in) cotton cheesecloth were soaked in 15% acetic acid for 1 minute. Each sample of fabric was then covered with a piece of treated photographic paper with the surface of the GSR pattern adjacent to the paper’s emulsion. Controlled test conditions

included using 100% cotton fabric and ironing the cheesecloth for 1 minute on medium steam heat with the weight of the iron on the cheesecloth using fiber base paper. An orange color developed on the photographic paper in the presence of nitrites. The photographic paper was then washed in 26°C (80°F) water for 1 minute and then rinsed with methyl alcohol.

Controlled testing procedures included using steam heat at 154°C (309°F) with the weight of the iron on the cheesecloth and ironing for one minute on fiber base paper. Five variables in the procedure were altered. They included: use of no steam heat, ironing for 2 minutes, increasing the weight of the iron by 1500 grams, use of RC paper, and increased iron weight also using RC paper.

In conclusion, the GSR pattern diameters on fabric ranged from 8.26 cm (3.25 in) to 12.07 cm (4.75 in) with the average diameter of 10.16 cm (4.00 in). The GSR pattern diameters on photographic paper ranged from 5.08 cm (2.00 in) to 8.89 cm (3.50 in) with an average diameter of 7.19 cm (2.83 in). The modified Griess patterns were approximately 30% smaller than the patterns on the fabric. The 100% cotton, 65% cotton and 35% polyester blend, and the 100% polyester fabrics yielded darker colors and larger patterns on RC paper than on fiber based paper. The blended and polyester fabric revealed an outline of the bullet hole in the GSR pattern on RC paper. All fabrics had a tendency to stick to the photographic emulsion when ironed for 2 minutes. Therefore, the recommended alternative method for conducting the modified Griess for 100% cotton, 65-35 blend and 100% polyester is to set the iron on steam heat at 154°C (309°F), add 1500 grams of weight to the iron and iron for 2 minutes on RC paper.

Gunshot Residue, Modified Griess Test, Powder Patterns

D76 Non-Lethal Firearm: Excessive and Inaccurate Terminology

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Certain ammunitions named “non-lethal,” often used by untrained persons can produce very significant or fatal wounds. A review of several studies would be necessary to estimate the penetration of this ammunition and to estimate the risks of fatal lesions. The goal of this presentation is to create a different or more accurate name such as “lethality reduced.”

This presentation will impact the forensic community and/or humanity by demonstrating the importance of the danger of non-lethal firearms evidenced by concrete cases during autopsies and recognizing studies on corpses. This demonstration could allow the reclassification of these types of weapons and to change their category in the French and European legislation.

Non-lethal weapons are by the definition approved by the NATO in September, 1999: “Non-lethal weapons are weapons which are explicitly designed and developed to incapacitate or repel personnel, with a low probability of fatality or permanent injury, or to disable equipment, with minimal undesired damage or impact on the environment.” Wounds caused by 12 various caliber ammunitions with non-lethal kinetic effect were studied, as well as blank cartridges from firearms.

Three weapons were used: 12/50 caliber Pistol SAPL GC 27, .9 mm Pistol Walther MLE P99, and 12/70 caliber Pump-action shotgun MLE 801.

Five types of ammunitions were studied: caliber 12/50 FUN TIR cartridge (16 mm diameter missile rubber ball), caliber 12/50 SLUG protection (16 mm diameter missile rubber ball), calibre 12/50 BUCK SHOT protection (6 mm diameter missile rubber buckshot), caliber 12 LD (16 mm diameter missile rubber ball), and .9mm P.A. Knall (blank cartridge).

Two anatomically intact, deceased subjects were used for the study: subject 1 is male, slight muscular build, low fat mass, and with fragile osseous structure; subject 2 is female with more pronounced muscular build and fat mass.

The shots were made by a marksman at a distance from the target

from 0 m to 1.5 m. The use of corpses modifies and limits the severity of the induced wounds. Indeed, on dead bodies, tissue retraction, inflammatory process, and bleeding, are absent. However, the characteristics of lesions remain better defined than those supplied by a gelatin form. The severity of aftereffects depends on the wounded anatomical zone. The most critical zones are head and vital organs even when the impact did not cause penetration.

This study demonstrates that at a shot distance of less than 0.5 m, most ammunition penetrates the body and creates fatal wounds. It would be necessary to conduct additional experiments to estimate the limits of distance through clothes and different shot angles.

Estimation of lesion risk inherent to the various types of non-lethal ammunitions is difficult because of the different parameters playing in wound mechanism (shot distance, ammunition conception, victim type, wounded anatomical zone, protection type). It is difficult to find the best compromise between efficiency (assailant neutralization), and wound profile (reversible after effects). However, the researchers were surprised by the wound severity caused by certain “non-lethal” ammunitions, which can be used by unprepared individuals. It would be desirable to create a different more accurate name such as “lethality reduced.”

Non-Lethal Firearms, Gunshot Wounds, Lethality

D77 Bland Murder Cases: A Spicy Recipe for Possible Conviction

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The goal of this presentation is to illustrate the possibility of a favorable outcome in the judicial system of cases which may lack one or all of the key elements generally thought necessary for conviction through presentation of a case which was successfully adjudicated despite lack of an eyewitness, murder weapon, or confession based upon a strong circumstantial case corroborated by forensic evidence; and to highlight the significance of interviews, scene investigation, physical evidence, and exploration of the many tips that arise during the course of a homicide investigation and the complementary role each plays in the favorable resolution of a case which may initially appear hopelessly unsolvable.

This presentation will impact the forensic community and/or humanity by reinforcing the importance of teamwork in a homicide investigation, i.e., relate how information/evidence collected by one group of investigators/scientists may corroborate that by others converting a weak case against a suspect into a powerful case even in the absence of the primary elements many deem necessary for a successful outcome in the judicial system.

Like a skillful chef presenting a fine meal for the hungry, many prosecutors prepare (for a jury) hearty helpings of testimony filled with at least one, if not all, of the three main ingredients often required for successful prosecution in many murder cases:

- 1) A witness to testify to the events of the crime and to identify the suspect.
- 2) The murder weapon linking the suspect to the victim's death.
- 3) The suspect's detailed account of his/her involvement (confession).

Naturally both investigators and prosecutors prefer that all three ingredients be served together at the banquet of justice, but in an imperfect and unpredictable world they are often faced with the prospect of presenting a bland case to the jury without any of the three elements, which provide the usual spice. While these cases may initially lack the flavor and substance to stimulate the palette of most jurors, a few added ingredients may enhance the existing flavor so that the case is more palatable. Often the identity of a potential suspect finds its way into the investigator's notebook from an

anonymous tip, but without one, if not more, of the crucial ingredients, the hope of an arrest and prosecution is doubtful. In many such cases, careful examination of forensic evidence secured during the investigation in connection with the circumstances surrounding the death may convert an otherwise unsolved murder into a compelling circumstantial case with successful resolution in the criminal justice system. This link provided by the physical evidence and a powerful circumstantial case may add the “spice” required to convert that weak unpalatable case with none of the three aforementioned primary ingredients into a feast that most jurors will savor.

This presentation examines the murder of a male subject who was shot to death in suburban New Orleans in April 2002, in retaliation for burglarizing the defendant’s vehicle. Common to many murder cases, this investigation lacked an eyewitness, and yielded no suspect weapon or confession. In contrast to many cases with ballistic evidence where the possible brand and model of weapon are multiple, in this case the Firearms Examiner was able to identify a specific caliber, brand and even model number based upon the evidence left on the scene by the suspect. Investigators subsequently secured documentation of the suspect’s ownership of a weapon of this specific type from a pawnshop owner, and an interview provided information, which led other investigators to a distant location where additional physical evidence was, recovered which exactly matched that from the primary scene of the crime. This physical evidence in concert with the other investigative information formed the nexus of the case linking this suspect not only to a specific weapon of this type, but also to participation in this crime.

Murder, Investigation, Ballistic Evidence

D78 Crime Scene Registration Using Photography and Laser Scanning for the Purpose of Documentation and Scenario Testing

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The goal of this presentation is to provide guidelines for crime scene registration in all stages of a forensic investigation using state of the art techniques including panorama photography, video, laser scanning, aerial photographs, GPS and geodimeters, and data from cell phones and surveillance video; and to provide guidelines for presenting 3-D computer models of crime scenes and animations showing scenario’s

This presentation will impact the forensic community and/or humanity by providing simple guidelines for more accurate and complete crime scene registration and how to take full advantage of new technologies such as photogrammetry, laser scanning, computer modeling, and animations that might be available within their organizations or that might be offered by commercial companies.

Since commercial companies have been offering services, such as 3-D animations of scenarios for crimes and accidents and 3-D laser scanning of crime scenes, a program was started at the Netherlands Forensic Institute (NFI) to do an extensive exploration of all the possibilities and limitations of these new technologies in criminal case investigations.

The first case in this program was the investigation of the firework disaster that happened in Enschede in 2000. In this case a 3-D model of the scene and an animation to demonstrate a scenario for the chain of happenings that led to the fatal explosion based on the outcome of all forensic investigations was created. Then, a number of new questions came up that could be answered by use of the 3-D model and photogrammetry. Since then, experience with 3-D modeling for the purpose of photogrammetry in video material (e.g. estimation of the body length of a robber or the speed of a car), reconstruction of bullet trajectories, virtual blood spatter stringing, and visualization of crime scenes and scenario’s for industrial accidents and murder cases has been acquired.

In all cases, researchers have observed that animations and visualizations can be very suggestive in unexpected and surprising ways. In a 3-D

visualization of a scene it is important to give information about the geometrical accuracy and the completeness of details and traces. In animations it is important to show the difference between facts and hypotheses.

Further, it was noted that crime scene recording happens in different stages. During the first response to a crime incident, no systematic registration is done and a lot of changes of the crime scene are unavoidable. Information has to be gathered from eyewitnesses, surveillance video, phone taps of emergency calls, photographs and video taken by by-passers or journalists, etc. This information can be used to get an overview of the scene during the crime and the changes during the first response. Then, the forensic investigation starts which an overview and close-up photographs are taken. In this stage the crime scene is changed when evidence material is gathered for further investigation.

Finally, in some cases it is necessary to go back to the crime scene to do a more accurate registration of the scene for the purpose of documentation, photogrammetry, reconstruction of trajectories of bullets, blood spatters, cars, people, etc., and validation of results. In the last two stages use of 3-D laser scanners was tested.

One of the main problems observed with the use of close-up photographs, overview photographs, and laser scans taken by different people in different stages of the investigation is to assess the relative position and orientation of the depicted objects, persons and traces.

This paper, discusses some techniques and guidelines for crime scene registration in different stages of the investigation using photography, video, laser scanning and markers. Some examples of crime scene documentation using interactive 3-D visualizations are given.

Crime Scene Registration, Computer Modeling, Virtual Crime Scene

D79 Standard Guidelines for Field Investigation Drug Officer (FIDO) Program

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Attendees will learn about an existing successful model, as well as standardized guidelines for implementation, operation, and continuing support of Field Investigation Drug Officer (FIDO) program.

Successful implementation of the FIDO program will impact the forensic community and/or humanity by having the potential to streamline the adjudication process, enabling the reduction of backlogged drug investigations and the efficient use of resources.

The efficiency of the entire criminal justice system is impacted by the overwhelming caseload of drug investigations. As a result, many cases fail to be prosecuted in a reasonable time frame or are dismissed due to a lack of timely sample analysis.

Straightforward possession drug cases comprise a significant percentage of those investigations. Handling the cases at the investigative level has the potential to streamline the adjudication process, enabling the reduction of backlogged investigations and the efficient use of resources.

Based on the evaluation of an existing model, operated by the Phoenix Police Department, the effective implementation of a Field Investigation Drug Officer (FIDO) program affords certified officers the capability of providing a preliminary identification of the most commonly encountered drugs of abuse. The benefits include immediate investigative information without the need for extensive laboratory analysis as well as facilitation of case adjudication in the preliminary phase. The results of the field-test factor into obtaining a plea agreement. However, cases proceeding to trial are submitted for complete analysis at the laboratory. The successful program in Phoenix has demonstrated a positive impact on the regional criminal justice system with cost savings and increased efficiency at all levels.

The National Institute of Justice (NIJ), in partnership with its National Law Enforcement and Corrections Technology Centers (NLECTC) and Forensic Resource Network (FRN), has addressed this issue. A focus group

D1 Medico-Legal Implications for Osteogenesis Imperfecta in Cases Involving Possible Child Abuse

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The goal of this poster presentation is to present to the forensic science community a review of the available literature concerning the identification of child physical abuse and the medico-legal implications concerning the brittle bone syndrome known as osteogenesis imperfecta.

An intricate aspect of forensic osteological investigations is the ability to differentiate skeletal trauma resulting from accidental and non-accidental injuries. This ability becomes more important when confronted with cases involving potential child physical abuse. The failure to recognize skeletal trauma caused by child abuse and skeletal trauma resulting from accidents or congenital conditions can result in the compromise or obstruction of child protection. Erroneous interpretations as to the manner in which skeletal trauma occur could inhibit full assessment by non-medical advisers while reinforcing parental denial, thereby putting a child at risk of physical harm or even death (Lynch 1995). Conversely, skeletal trauma resulting from congenital conditions such as osteogenesis imperfecta, a brittle bone condition that primarily affects infants and young children, can and has been confused with non-accidental injuries. Due to inaccurate diagnoses, the lives of both parent and child have been severely affected when confronting such situations (Paterson 1997).

The present poster presentation seeks to provide a comprehensive review of the available literature concerning past and current research involving the medico-legal implications of osteogenesis imperfecta when diagnosing children exhibiting unexplained fractures. In doing so, this poster presentation provides a brief historical account of the recognition and diagnosis of osteogenesis imperfecta and child physical abuse. Following is a description of the etiology of the disease and an account of the various fractures prevalent in young children and infants. Specifically, an overview of fracture patterns resulting from abuse, accidents, and osteogenesis imperfecta is presented. Four child abuse related cases (Interest of J.V., *Lamberton v. State*, *Awkerman v. Tri-County Orthopedic Group*, and *Matter of Mathew D.*) are also discussed in this poster presentation to examine the validity of arguments that suggest osteogenesis imperfecta can be confused with physical abuse.

The medico-legal implications of osteogenesis imperfecta, as argued in this presentation, relate to the attempt by abusers to avoid prosecution by using the osteogenesis imperfecta defense. It also relates to inadequate medical examination by physicians leading to misdiagnosis. A proper medical examination will always differentiate osteogenesis imperfecta from physical abuse. This researcher contends that there is no excuse for misdiagnosis of osteogenesis imperfecta in favor of child physical abuse. Moreover, this presentation serves as a starting point for future investigations providing research guidelines whereby better and more accurate diagnostic techniques for the osteological identification of osteogenesis imperfecta within a medico-legal context are possible.

In addition, this poster presentation seeks to make forensic anthropologists aware of the need for more involvement in cases where child physical abuse is suspected. According to Walker et al. (1997), this is an area that has received little attention from anthropologists. Yet, a forensic anthropologist can make a tremendous contribution. For specialists with little or no experience in human skeletal remains

analysis, cases involving potential child physical abuse can prove to be challenging. The diagnosis of the battered child syndrome is very different when looking at radiographs or directly at bone. Radiographically invisible lesions are in many cases apparent when carefully conducting gross examination of bone (Walker et al. 1997). Furthermore, to the inexperienced eye, congenital conditions such as osteogenesis imperfecta can provide a source of confusion in determining whether skeletal lesions resulted from non-accidental injuries or from some other reason (Ojima et al. 1994; Gahagan and Rimsza 1991). In general, the goals of this poster presentation are to encourage continuous research and interest in this subject.

Osteogenesis Imperfecta, Brittle Bone, Child Abuse

D2 DNA Analysis of Submerged Pine Logs

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After attending this presentation, attendees will understand methods of extracting and analyzing DNA from woody tissue for the purposes of historic or genetic reconstruction of forests.

This presentation will impact the forensic community and/or humanity by demonstrating more reliable protocols for wood DNA extraction are needed for timber certification, forensics and criminal prosecution, nautical archaeology, paleobotany and especially for reconstructing colonial history. We demonstrate here the use of DNA extraction and analysis from submerged logs as a reliable tool in reconstructing North American forest genetic composition and diversity. Submerged logs constitute an "accidental museum" for reconstructing pre-settlement forests along the Atlantic seaboard and the Gulf of Mexico. This method also holds promise in archaeology for DNA analysis of early wooden buildings, wooden ships, wooden forts and wooden tools of early European colonists.

DNA analysis of submerged logs is a novel approach to historic and genetic reconstruction of North American forests. Along the Atlantic seaboard, Gulf of Mexico, Great Lakes and Puget Sound, logs were rafted along flat rivers and estuaries in the 19th century as a means of transport. During rafting, many logs sunk and were preserved from degradation in deep anaerobic silt 7 to 15 m below the water's surface. The value of these submerged logs for historic purposes depends on reliable methods for extracting high molecular weight DNA. DNA analysis of submerged logs has value for identifying species and for measuring polymorphism for population genetics studies. Criteria for a reliable protocol include 1) high-molecular weight DNA extraction, 2) amplification of *rbcL*, a chloroplast gene indicating DNA origin from a photosynthetic plant, 3) a close homology between ribosomal DNA sequences and those of putative forest tree species and 4) assaying for DNA polymorphism. A DNA protocol was developed for submerged pine logs dredged in the Cape Fear River near Wilmington, NC. DNA extraction was based on a CTAB protocol modified with proteinase K, RNAase and polyvinyl pyrrolidone (PVP) steps. Crude extraction of DNA from five submerged log samples was followed by stringent DNA purification. Chloroplast gene *rbcL* (ribulose-1,5- bisphosphate carboxylase) could be amplified in all samples. Intergenic transcribed spacer (ITS) sequences from ribosomal DNA were 98 to 94% homologous to sequences from two indigenous pine species, *Pinus taeda* and *P. palustris*. Assaying nuclear polymorphism required a variant of the DNA protocol purification step to improve amplification of single- and low-copy DNA sequences. A nuclear microsatellite was assayed; its

polymorphism matched 3 of the 14 known P. taeda alleles. This is a robust DNA protocol for wood, which will have broad research applications for reconstructing genetic patterns in pre-settlement forests as well as wood certification, forensics, paleobotany and nautical archaeology.

Gymnosperms, Forest History, Forensics

D3 Intergration of Molecular Pathology to Modern Forensic Medicine and Forensic Autopsy

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After viewing this poster presentation, Forensic personnel will learn the implementation of Molecular Pathology to facets of Forensic Medicine is beneficial to both autopsy and research procedures. The presentation notes, in a formal content analysis, many current research plans and procedures that one may adopt to autopsy practices. In addition, a formal Normative Survey of Forensic personnel indicates that the Forensic Science community welcomes implementation procedures. This research study also indicates a symbiotic relationship between the fields of Molecular Pathology and Forensic Medicine is beneficial to scientific growth in these respective fields.

This presentation will impact the forensic community and/or humanity by demonstrating for persons wishing to conduct laboratory research in the fields of Forensic Medicine and Molecular Pathology, this study provides support to indicate that this research is welcome by the scientific community providing grounds for grant funding for research in these areas. Researching actual Molecular Autopsy methods in an academic research setting could provide the necessary information for the integration into current autopsy processes occurring in Medical Examiner's office across the United States.

The field of Forensic Medicine provides a new, under-developed outlet for testing in Molecular Pathology. The current methods in Molecular Pathology, as stated earlier, are in Clinical Medicine and Research on tissues from living subjects. However, sampling from the deceased provides a large source of pathologic samples that can be analyzed. These samples can provide additional insight to end-stage disease processes, indicating more information about the pathological processes that lead to death. Also, by studying postmortem samples, Forensic Pathologist and researchers in this field can provide statistical information about causes and manners of death as well as statistical information regarding terminal illness and genetic conditions. Sampling from the deceased is recommended to provide a continual source of samples for Molecular Pathology and Molecular Autopsy procedures.

The application of Molecular Pathology to Forensic Medicine during autopsies can also advance the field of Forensic Pathology. By applying the Molecular Autopsy to Forensic cases, Forensic Pathologist can analyze samples for specific mechanisms of death. Sampling of wounds at the histological (molecular and cellular level), as in the case presented earlier, will provide another method to analyze wound types present in Forensic cases rather than just examining wounds by the naked-eye. By using microscopic laboratory methods, Forensic Pathologist will have additional methods to diagnosis the cause and manner of death. Although integrating these methods into current autopsies would be costly, integrating these procedures to Forensic cases is recommended in order to provide a more in depth autopsy analysis in these cases. The necessary equipment and Molecular Pathologist professionals could be integrated into the larger Medical Examiner's offices with appropriate funding.

Molecular Pathology is the clinical application of biotechnology to cellular autopsies. Procedures in Molecular Pathology are both descriptive and predictive in nature. The application of the "molecular autopsy," has been limited in the field of Forensic Medicine. Main

outlets for research in "molecular autopsy," procedures have been limited to Clinical Medicine and research. Molecular Pathology procedures could be beneficial to Forensic Medicine and modernize the autopsy process. By utilizing current molecular autopsy methods and researching new testing procedures, Forensic Pathologist may be able diagnosis the cause of death using these tests. Utilizing these procedures may also provide preventative information regarding disease. This research study will review current integration procedures in peer-reviewed scientific studies utilizing the integration Molecular Pathology and Forensic Medicine to access the success trend of the integration of these two fields. This research study will also poll professionals and students obtaining higher-education degrees within these prospective fields to determine if integration would be accepted and promoted within these two fields.

Forensic Medicine, Forensic Pathology, Molecular Pathology

D4 Homicidal Deaths in Delhi (1992-1996)

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After attending this presentation, attendees will understand the trends of homicidal crimes in developing nations like India.

A meticulous postmortem review was under taken in the department of FORENSIC MEDICINE MAMC to find out about trends in homicides during the period 1992-1996. Standard procedure for autopsy and review of inquest papers was conducted. Out of 3,886 medicolegal autopsies performed in the department during the said period, only 232 cases (5.9%) were homicidal deaths. The most common age group of victims was 21 - 30 years (38%). Males were victimized three times more than females. Incidence of crime was slightly more in the nighttime than daytime though evenly distributed during winter and summer seasons. In our series, sharp weapon injuries were the most common type (34.9%) followed by blunt force injuries (15.9%). Defensive wounds were present in 35 cases (15%). Violent rage/ quarrel was the motive in 61 cases (29%).

Homicides, Weapon of Assault, Victim

D5 Highly Informative Y-Chromosomal Haplotypes of Four Y-Specific STR Loci, DYS385, DYS446, DYS449, and DYS464

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This presentation will provide a good opportunity to discuss the possibility of a new set of small but efficient Y-STRs to substitute the established minimal haplotype.

This presentation will impact the forensic community and/or humanity by providing a good chance to discuss the possibility of new set of small but efficient Y-STRs to substitute the established minimal haplotype.

Y-chromosome-specific STR typing has become very useful in evolutionary studies and forensic casework, namely in deficiency paternity testing and in rape cases involving one or more semen donors. So far, numerous Y-STRs have been discovered and some have been

used for forensic purposes and population studies to evaluate diversity of the haplotypes. However, forensic researchers have been looking for small and efficient subsets of STRs that might distinguish more individuals. Therefore, the combination or addition of new Y-STR markers with extremely high gene diversity has been attempted in many groups. More recently, new highly informative Y-specific STRs (DYS446, DYS449, and DYS464) have been identified and expected to be useful for the establishment of small but efficient subset of STRs. In this work, we applied single multiplex PCR system to analyze 4 Y-STRs (DYS385, DYS446, DYS449, and DYS464) in 300 Koreans. We calculated the haplotype and allele frequencies, and the usefulness of these four highly informative Y-STRs was discussed by comparing its haplotype diversity with that of minimal haplotype.

Four Highly Informative Y-STRs, Haplotype Diversity, Minimal Haplotype

D6 Case Study – Consensual Sex, Genital Injuries, and Sexual Assault of a Fifteen-Year-Old Female

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The goal of this presentation is to discuss the concept that rape is a legal issue and the medical findings, or lack of findings, are based on the victim's history.

A 15-year-old female was seen at a SART (Sexual Assault Response Team) facility in San Diego County. An evidentiary examination was authorized by law enforcement. The 15-year-old disclosed:

- Consensual sex 2 - 12 hours before
- She passed out and woke up with a male putting his penis into her vagina
- Reported to law enforcement 12 hours later
- She stated "sex" hurt with all of them

FINDINGS: Multiple lacerations and abrasions 4-7 o'clock on the posterior fourchette going up to the fossa navicularis. Positive Toluidine Blue dye uptake

Positive examination consistent with the history as stated

CONCLUSION: Photo documentation of all the injuries allows the nurse to use photographs for peer review. Photo documentation also serves to document the injuries for other experts to review.

Sexual Assault, Photo Documentation, Colposcopy

D7 Postmortem Quantitation of Insulin and C-peptide in Cases of Suspected Exogenous Insulin Administration

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After attending this presentation, attendees will be presented with convenient methods for insulin and C-peptide determinations in postmortem blood samples for the purpose of identifying exogenous insulin administration

This presentation will impact the forensic community and/or humanity by providing a validation and application of commercially available RIA kits for the quantitation of insulin and C-peptide in postmortem hemolyzed blood specimens. The kits provide technically easy to perform and economically cost effective methods to obtain reliable results in helping to establish the role of exogenous insulin in

determining cause of death.

Homicide reports by exogenous insulin injection are rare. However, since insulin, and syringes to inject it, are readily available, and it is a potentially lethal drug, insulin should be given consideration in suspicious homicides. The ratio of insulin to C-peptide (insulin/C-peptide) may be used to make a forensic diagnosis of exogenous insulin overdosage. Endogenous insulin is secreted in equal proportion with C-peptide. Because C-peptide is more slowly cleared than insulin, the physiological insulin/C-peptide is less than one. Exogenous insulin will result in a ratio greater than one. Quantitation of insulin and C-peptide in a postmortem specimen can be cumbersome, and require large quantities to be present. Described below are simple and economical radioimmunoassays (RIAs) for quantitative determination of insulin and C-peptide in postmortem blood specimens.

Commercially available radioimmunoassay (RIA) kits were obtained from Diagnostic Systems Laboratories, Inc. (Webster, TX). Both kits have received FDA clearance, and have been used in pre-clinical toxicological, clinical and diagnostic applications. The standard curve covers a range of insulin concentration from 1 to 300 uIU/mL, and 0.1 to 20 ng/mL for C-peptide. Both RIAs require only 100 uL of specimen for a single determination. Blood specimens were collected from three deceased individuals who had a medical history, which included diabetes and insulin therapy at the time of death. The specimens were grossly hemolyzed, even after centrifugation at 1000g. Duplicate aliquots of each specimen were stored frozen at -20 and 4 degrees C for three days. Because both RIAs were designed for determinations in non-hemolyzed serum and plasma, validation was required for a grossly hemolyzed postmortem blood specimen. Validation included adding known amounts of insulin and C-peptide standards to the hemolyzed specimens and performing assays for recovery and linearity studies.

Insulin standards ranging from 1 to 150 uIU/mL were added to the specimens and when assayed gave recoveries of 94 to 103%. Serial dilutions of 1:2, 1:4 and 1:8 of one specimen gave linearity from 75 to 120%. Only one specimen contained enough insulin to allow for linearity by dilution studies. All specimens were assayed in duplicate with results within 10% CVs. Using these procedures, the specimens were quantitatively assayed for insulin. Specimens stored at -20 degrees C had insulin levels of 88.5, 4.3 and undetectable (less than 1.5) uIU/mL. Specimens stored at 4 degrees C had lower insulin levels of 70.3, and less than 1uIU/mL in the remaining two specimens. Thus, freezing would be the preferred storage condition.

Recovery assays for C-peptide included additions ranging from 0.1 to 10 ng/mL, and gave recoveries of 52 to 98%. Linearity by dilution studies were not possible at this time because all three the specimen contained too little C-peptide. The CVs of duplicates were less than 10%. C-peptide concentrations in the specimens from the three deceased cases were undetectable (less than 0.1), 0.25 and 0.1 ng/mL respectively. Specimens stored at 4 degrees C had undetectable C-peptide concentrations (less than 0.1 ng/mL). Again, freezing provided the best storage conditions.

In conclusion, the specimen with 88.5uIU/mL of insulin could be of exogenous source since the C-peptide was less than 0.1 ng/mL. In addition, the commercial assays have reliable performance for use with grossly hemolyzed postmortem specimens.

Insulin, C-Peptide, Postmortem

D8 Homicide or Suicide? An Equivocal Death Investigation

Vernon J. Geberth, MS, MPS, Lt. Commander (Retired), New York Police Department, PO Box 197, Garnerville, NY 10923*

The goal of this presentation is to present to the members of the

forensic community the complications involved in an equivocal death investigation, specifically, those equivocal deaths involving a “Staged Crime Scene.”

This presentation will impact the forensic community and/or humanity by indicating the importance of crime scene reconstruction coupled with the evaluation of victimology in determining the factors in an Equivocal Death Investigations. I show examples of suicides involving long barrel firearms and make reference to wound structures due to high velocity rifles. I also illustrate how it this case was forensically impossible. The impact of my presentation occurs as the audience actually sees how the original investigation was unprofessional and resulted in an erroneous finding. The audience is then presented with an alternative finding based upon the forensic evidence and the victimology.

“Equivocal death investigations are those inquiries that are open to interpretation. There may be two or more meanings and the case may present as homicide, suicide or accidental death. The facts may be purposefully vague or misleading as in the case of the “Staged Crime scene.”¹

In this case, the deceased was a single, 25-year-old male. His body was discovered lying on his back with his feet on floor as if he had fallen back onto the bed. A Winchester semi-automatic .308 Model 742 was between his legs. The victim owned the weapon, which came from the premises. There were various amounts of blood, skull and brain matter found in the bedroom. The velocity blood spatter traveled in a South direction going into the bedroom closet. The victim’s brain was found in the front hallway, which was in the opposite direction of the velocity blood. This would be North and East from the bedroom. The entire upper half of the skull was absent due to the gunshot wound. There were two bullet holes in the roof above where the victim was discovered. However, there wasn’t any blood, brain matter or tissue on the ceiling. The police investigators concluded that the deceased had shot himself twice in the head with the high-powered rifle. There were two empty shell casings found by his feet and three live rounds were recovered from the gun, which belonged to the deceased. An open box of Remington .308 ammunition was found in an adjoining room. According to the police report, “There was no evidence of a break-in and the rest of the trailer was observed and there were no signs of a struggle.” The police and coroner assumed that the death was a suicide. A local hospital pathologist conducted an autopsy and determined that the cause of death was a gunshot wound to the head and ruled the death a suicide.

The consultant determined that the scene had been “staged” to make the death appear to be a suicide and concluded that the police investigation was both perfunctory and inadequate according to recognized standards of death investigation. There were numerous investigative errors and serious omissions. A crime scene reconstruction would have revealed that it was forensically impossible for the deceased to have committed suicide as presented in the scene. A detailed examination of the crime scene including the process of the crime scene and weapon for fingerprints was not undertaken. The police did not attempt to recover the fired rounds. The gun was never tested nor did the police conduct any ballistic examinations or perform any GSR testing. The police did not reconstruct the event nor take into consideration the operation of the alleged suicide rifle.

Reconstruction Considerations

The hospital pathologist concluded that the death was a suicide. However, he could not define nor determine the exact location of the entrance wound. In his report he stated, “The entire upper half of the skull completely absent secondary to gunshot wound of skull. Examination of mouth discloses upper and lower natural teeth in excellent dental care. From the outline of the remainder of the skull cavity, the entrance wound appears to be from left to right and upward.”

A forensic pathologist would have insisted that the authorities provide the pieces of shattered skull and then glued them together to determine the outline and entrance of the bullet. A forensic pathologist

would also have been able to determine if one or two shots had been fired into the brain.

In suicides involving long barrel firearms, such as rifles or shotguns the victim usually selects the forehead, followed by the temple, the mouth or under the chin. The temple shots are usually consistent with the handedness of the victim. In other words, if the victim was right handed the wound will be found in the right temple. In this particular case the victim was right handed. The wound, according to the hospital pathologist was to the left temple.

Placing the barrel of the Remington .308 Model 742 to his left temple would have been extremely awkward if not impossible. The Remington .308 Model 742, which is a semi-automatic rifle, ejects the rounds to the right of the stock anywhere from 8 to 12 feet. In this particular case the police reported finding two spent .308 cartridges by the victim’s feet at the base of the bed. It is also important to consider the effects of such a high-powered rifle on the victim. For instance, wounds of the brain from high velocity rifles such as the Remington .308 Model 742 are extremely devastating and produce a bursting rupture of the head. It would have been physiologically and neurologically impossible for the deceased to have fired two rounds into his head with this type weapon. In addition, the discharge of a .308 would have pulled the gun out of the deceased’s hands and sent the rifle flying in the opposite direction. The gun would not be conveniently sitting between the deceased’s legs with the barrel pointed toward the head.

Remington .308 Model 742 has a tremendous kick-back. The ammunition found at the scene was .308 Win ammo. This translates into 150 to 180 grains providing a velocity of 2200 to 2960 feet per second. In my expert opinion, it would have been virtually impossible to fire this weapon twice into the head in an upward direction toward where the two holes were observed by the police and not leave blood, hair, or brain matter on the ceiling. The insurance company’s expert witnesses had concluded that the death of the victim was suicide and was caused by a self-inflicted gunshot wound to the mouth. The consultant dismissed these findings as erroneous and inconsistent based on the hospital pathologist’s report.

Furthermore, the insurance company’s inquiry conveniently disregarded the most important issue in this particular case. What was the intention of the deceased to take his life?

Victimology

Many suicide deaths are preceded by verbal threats of self-destruction and other indications of despondency. In some instances these threats are made to people whom the deceased respects or thinks highly about.

In other instances the sudden change in behavior is shown by subtle actions, such as increasing life insurance, giving away prized possessions, speaking of life in the past tense or abuse of alcohol or drugs. These behaviors are termed “Warning Signs” and present the investigator with a base of inquiry, which can support a hypothesis of possible suicide.

The victim in this particular case was a twenty-five-year-old single male, who was socially active. He was last seen at work on Monday when he paid his union dues three months in advance. He did not report to work on Tuesday and his body was discovered on Wednesday.

He was expecting a visit from his fiancé, who was going to stay with him at the trailer. In fact, he was in process of renovating the trailer for his fiancé. He had had purchased paint and wallpaper and had borrowed tools from his neighbor to re-do the kitchen cabinets and had just built a new deck on the trailer. He had recently made a loan application for a trip to Alabama because he owned property in Alabama and planned on relocating there in the Fall with the fiancé after clearing the property. He also attended a local Community college at night and maintained a 90% G.P.A. My opinion of these factors was that they certainly didn’t fit the profile of a suicide victim.

The police disregarded the following facts:

- The victim kept at least \$1000.00 in cash in his trailer, but the police recovered only \$2.50. Victim's car found unlocked - keys in ignition.
- The victim's empty wallet was found on floor of the car.
- The victim's tools and radar detector were missing from his car.
- The victim had purchased a Birthday card for sister. A \$50 bill was missing from card.
- The victim purchased \$70 worth of groceries on Monday afternoon.
- There were cigarette butts in ashtray. The victim did not smoke.
- A Gold calculator was missing from the scene. It was later found in town Pawnshop.

Conclusion

It was quite apparent that the victim's death was in fact a murder and not a suicide.

I believe that the authorities made the mistake of assuming that the death of the victim was a suicide. Their assumption was based on the fact that this event was a "Staged" crime scene.

The preliminary observations of the crime scene by the authorities were erroneous as they failed to take each factor to its ultimate conclusion. It is apparent that a detailed examination of the crime scene, including the process of the crime scene and weapon for fingerprints was not undertaken. The background information of the deceased regarding his motivation apparently was not taken into consideration in determining whether or not the facts of the case were consistent with their theory of suicide.

The consultant determined that there were numerous investigative errors and serious omissions in this investigation as well as an obvious failure to forensically support the classification of suicide with evidential facts. The authorities failed to pursue and evaluate the crucial information supplied by the reporting witnesses and next of kin regarding the missing money as well as property taken from the trailer and victim's car. This Wrongful Death consultation revealed the death to be a homicide and exposed the police investigation as perfunctory and inadequate and not in accordance with recognized standards of professional death investigation.

¹ Geberth, V.J. *Practical Homicide Investigation: Tactics, Procedures, and Forensic Techniques*. Third Edition, Florida: CRC Press, LLC, 1996, p. 20.

Equivocal Death, Staged Crime Scene, Crime Scene Reconstruction

D9 SNP Based Ancestry Informative Markers for the Inference of Biogeographical Ancestry (i.e., "Race") and the Estimation of Admixture: Application for the Louisiana Serial Killer Case

Tony Frudakis, PhD, Matthew J. Thomas, PhD*, and Zach Gaskin, BS*, DNAPrint Genomics, Inc., 900 Coconut Avenue, Sarasota, FL 34236*

After attending this presentation, attendees should retain that SNP based DNA tests for forensics exist and have been used in a high profile case.

The impact of this work became evident in the recent Louisiana Serial Killer case where we determined by a SNP based DNA test that the suspect was 85% Sub-Saharan African & 15% Native American. The Louisiana task force, following eyewitness accounts and an FBI profile that the suspect was a caucasian, had run out of leads. We performed our DNA Witness 2.0 test and two months later the task force had the man linked to 6 homicides through STR typing in custody. The alleged murderer was, in fact, African American. This test could aid in any case where there is a biological sample left at the crime scene and you have no suspect or conflicting eye witness accounts of what ancestry your

suspect is. The true impact to society comes when this investigative tool is utilized to expedite the investigation thus getting criminals off the streets before they have time to strike again.

Biogeographical Ancestry is the heritable component of "race," but to date, no method has been described to accurately measure genetic structure within individuals. Socio-cultural and geo-political metrics for measuring human "race" are human and not natural constructs, therefore eye-witness accounts and the investigative interpretation of these accounts are notoriously unreliable. In this presentation, we present novel markers and methods by which to do this. We mined the human genome sequence for candidate Ancestry Informative Markers, validated them on an ultra-high throughput genotyping platform and established parental population allele frequencies. Using 71 of the most informative AIMs, covering most of the chromosomes, and coalescing the human population to four main continental population groups (sub-Saharan African, East Asian, Indo-European and Native American), we use a maximum likelihood method to determine individual BGA admixture proportions and their associated confidence intervals. We observed that self-reported population affiliations correlated almost perfectly with the majority BGA population affiliation determined for a sample of 3,300 international samples. BGA admixture results were surprisingly frequent, and when observed, were generally not inconsistent with anthropological and geopolitical history. The admixture proportions produced tracked in family pedigrees in a manner consistent with the law of independent assortment, and simulation revealed that the markers relevant for resolving the group affiliations functioned independently within the confines of our algorithm. Because a large number of high Δ value markers were used, the test was surprisingly robust; reasonable levels of simulated allele frequency errors that could be caused by biased parental sampling had no significant impact on the BGA proportions determined. Combined, these results show that BGA admixture can be reliably read from the DNA. In March of 2003, we applied this technology to assist with the Louisiana Multi-Agency Homicide Task Force Serial Killer Case, which had been bogged for the prior year. Prior to testing, and based on two separate eye-witness accounts, the killer was believed to be a Caucasian, or European American individual. The results of the test suggested that this profile was not accurate and that the killer was of 85% sub-Saharan and 15% Native American BGA. Based on these results, DNAPrint advised the Louisiana Serial Killer Task Force to abandon dragnets of Caucasians and focus exclusively on African Americans of average African American skin tone. The Task Force embraced this result, and within two months, their shift in focus towards leads consistent with the BGA profile resulted in the swabbing of an African-American individual that was eventually matched with the crime scenes through STR profiling. The case represents the first successful application of a multi-factorial post-human genome test for forensic sciences that the Company is aware of. We will also present progress made for other genome-based methods of physical profiling, such as the inference of human iris and hair color within individuals of mainly Indo-European descent.

Biogeographical Ancestry (BGA), Ancestry Informative Markers (AIM), Louisiana Serial Killer

D10 Power Tool Injury Biomechanics

Gary S. Deegeer, MD, Biodynamic Research Corporation, 9901 IH 10 West, Suite 1000, San Antonio, TX 78230*

After attending this presentation, attendees will gain the ability to recognize and interpret the patterns in injuries involving power tools and how to apply this and other information to reconstruct the injurious event.

This presentation will impact the forensic community and/or humanity by adding to the body of knowledge regarding injury pattern

recognition and the integration of applicable information to injurious event reconstruction. By the reconstruction of events, such as power tool injuries, alternatives to safety and guarding can be recognized.

Power tool injuries represent an interesting subset of traumatic injuries that may be difficult to interpret accurately. It is possible, with specific knowledge of the tools involved, the circumstances of the incident and patterns of injury to bone and soft tissues, to reconstruct power tool injuries.

Although tool mark forensics are well known within the forensic community, this work differs dramatically by using the integration in forensics of medical knowledge, kinesiology, anthropometrics, bloodstain pattern analysis, and alternate light sources. This integrative approach is combined with knowledge of power tool operation and uses, available force, and configuration to arrive at a reconstruction.

The injuries are generally divided into soft tissue and boney injury. Soft tissue injuries are then subdivided by traditional types in forensic medicine. Each type of soft tissue injury can then be related to its particular mechanism for causative information.

Boney injuries, when examined, are typically interpreted by fracture type. However, in power tool injuries these can be placed more appropriately along a spectrum of cut versus crushed bone. Research in the response of boney tissues (and soft tissues) to power tool implements has been done over the past 8 years and the results of these studies support the accurate determination of the amount of tool force, the direction of force, the order of the injuries, and the orientation of the tool to the injured part.

Examination of the involved tool and any available work piece or work area can yield pertinent information regarding the injurious interaction. General consideration during the examination should be taken of any damage, tool marks, tool condition and operation, and existing tool configuration. Blood stain and tissue spatter patterns should be sought using visible and alternate light sources. This particular set of collected data must be interpreted with knowledge of power tool interactions with living tissues. Research in this area has been done as well. This information, combined with case studies, has yielded important interpretive clues for power tool injury reconstruction.

Knowledge of how a particular tool is used and misused, the force (power and direction) of the tool operation, available tool configurations, and tool dimensions (including weight) is combined with the above typical forensic analysis to arrive at the final reconstruction. Occasionally, static and/or powered testing of a tool is required to fully understand the operation and forces involved for that particular tool.

Extraneous factors should be included in the analysis. The medical history of the injured individual often produces critical pertinent information, such as seizure disorders, previous injuries, vision or other sensory problems, medications, substance abuse, psychiatric problems, and congenital disorders. The individual's state of health at the moment of the injurious event is often reflected in the medical records. Although these should be previously scanned for injury information, other helpful information, such as toxicology screens, should be sought.

Any reconstruction must entertain alternative scenarios that can be excluded or used to modify the existing hypothesis. The integration of kinesiology and anthropometrics into the reconstruction assists in this end of the analysis. Matching the injured individual to the injurious tool directly or through the use of surrogates and exemplars often clarifies the reconstruction. Even simple testing using easily available surrogate tissues can assist in the reconstruction by examining injury outcomes in the patterns produced by the tool and tissue interactions in varying configurations.

The approach used here is broadly applicable due to its foundation in forensics. The specifics of the analysis are based upon appropriate knowledge and pattern recognition. It is hoped that this work will bolster the sparse information available in the area of power tool injuries.

Power Tool Injury, Injury Pattern, Accident Reconstruction

D11 Digital Crime Scene Reconstruction

Brian D. Carrier, MS, and Eugene H. Spafford, PhD, Purdue University - CERIAS, Recitation Building, 656 Oval Drive, West Lafayette, IN 47907*

The goal of this presentation is to show the high-level theory and procedures that have been developed for physical crime scene reconstruction can be applied to digital crime investigations. This allows the field of digital forensics to utilize theories that have been tested and proven in the courts.

This presentation will impact the forensic community and/or humanity by demonstrating the observation that digital forensics is more similar to a crime scene investigation than it is to other forensic areas. The physical computer is just the housing for many pieces of evidence, each of which can be used to reconstruct the events that occurred prior to a crime. This presentation shows how to categorize digital evidence so that it can be used in a digital crime scene reconstruction. This will make solving investigations more efficient and give more credibility to the result of digital investigations.

This paper applies the high-level theory and procedures of physical crime scene investigations to digital crimes. Using the physical crime scene investigation phases, including preservation, survey, documentation, search, and reconstruction, this paper describes how a digital device can be investigated using the same high-level procedures that have been developed over many years in the physical world. Digital devices and computers are now involved with the investigation of many crimes, including the use of a computer to attack a high profile Internet site, distributing child pornography over the Internet, or two criminals communicating via email. In each case, one or more computers must be analyzed to find traces of digital evidence. This process has been called digital or computer forensics and applies to laptops, servers, mainframes, cell phones, and PDAs.

The area of digital forensics is relatively young and is in the process of developing the theories and methodologies that are needed to make it more science than art. Digital evidence has not been seriously challenged in the courts, but it is expected to be in the future. By correlating the phases of digital investigations with those of physical investigations, credibility can be achieved for the digital investigation process.

This paper approaches the computer as a crime scene and applies the theory of physical crime scene investigation. A digital crime scene is the virtual world that is created by an operating system, software, and hardware. Data is constantly entering and exiting the system and traces of system activity are left behind. Temporary files are created when documents are opened and the Internet activity of a user can be traced days later. The classical crime scene investigation phases of securing the scene, surveying the scene for obvious evidence, documenting the scene, searching the scene for additional evidence, and performing a crime scene reconstruction all directly apply to the phases of a computer investigation. This paper provides an overview of how a computer investigation uses the same high-level phases as a physical crime scene investigation, but with different procedures. The process model considers the digital crime scene to be a secondary crime scene to the physical location where the computer is located. This is important because the end goal of any digital investigation is to identify the person responsible.

The primary focus of this paper is on the crime scene reconstruction phase for a digital crime scene, where evidence is classified and the scientific method is used to reconstruct the events that occurred during the incident. This research uses the published literature to show that digital crime scene reconstruction is similar to physical crime scene reconstruction and that digital evidence can be classified in the same

categories as physical evidence, although with different criteria. For example, the existence of and contents of a given file can be functional evidence that an application was executed on the system. Similarly, the existence of deleted data that was created when an application was executed can be functional evidence. Many applications and operating systems save a history of user activity and it can be used as relational evidence because it shows what actions the user performed and in what location they were performed. Relational evidence can also be found in the existence of a temporary file that shows that an application was executed in that directory.

The paper will show how digital evidence can be sorted into each of these categories to efficiently solve digital investigations and discusses how much the evidence can be trusted. Digital investigations are becoming more common and generally accepted process models and approaches must be defined. The physical investigation procedures are generally accepted and should be applied to digital investigations whenever possible. This paper shows the first attempt at defining the process and classification definitions for digital crime scene reconstruction.

Digital Forensics, Digital Evidence, Crime Scene Reconstruction

D12 Empirical Elimination of a Digital Enhancement

Joerg Hess and H. Dale Nute, PhD, Florida State University, 4750 Collegiate Drive, Panama City, Florida 32405*

After attending this presentation, attendees will understand the necessity to empirically validate photography enhancement algorithms.

This presentation will impact the forensic community and/or humanity by serving to caution those working with photography enhancement that subjective observations coupled with enhancement may present an erroneous implication.

The importance of empirical validation of photo enhancement algorithms was demonstrated by a case in which a photograph was enhanced, appeared to show an object in a particular location and, upon investigation, was demonstrated not to be present.

The case involved a boating accident in which two individuals overturned a small rowboat at night in extremely cold water. One victim was found floating next to the shore the next morning but the second was never found. Extensive searches were immediately conducted including an air search, shore search, and cadaver dogs, and an underwater search with divers. Although the victims were thought to be relatively close to the shore, the bottom of the lake dropped precipitously. Subsequent underwater searches over the next two years were conducted using side-scan sonar, and drop cameras. On the last day of one of the searches, an interesting photograph was acquired on the video recording of a drop camera but the battery was almost discharged and the photograph quality was extremely poor. The photo appeared to show a boot and a portion of a leg. The “rest of the body” would have been outside the frame of the photograph. The location of the camera at the time of the picture was initially calculated to be around 200 feet but later measurement of the cable determined it to be closer to 170 feet.

Standard contrast enhancement by Adobe Photoshop was performed and the features of a boot and trousers leg seemed to be even more apparent. Based on the photograph, another search was set up. This search was jointly conducted by four agencies and employed a newer model of side-scan sonar, two models of remotely operated vehicles (ROV) with video, another drop camera, and divers. The GPS coordinates of the photograph were extrapolated from the data supplied by the operators of the drop camera on the previous search.

The search protocol was to conduct a side-scan sweep of the area

surrounding the GPS coordinates, download the data, identify potential targets, determine their precise GPS coordinates from the software, then deploy the ROVs and drop camera to verify or exclude the target. Using this strategy all targets in the primary search area were excluded. The search protocol was then repeated on the areas immediately next to the primary area. All targets in the secondary area were also excluded. Due to the persuasive nature of the photograph, it was decided to perform a redundant exclusion in the primary area. Two divers used a circle search to clear the area and eliminated all targets.

Because the enhanced photograph had generated such high expectations by everyone involved, especially the family of the missing victim, it was decided to demonstrate the source of the photograph. The target closest to the GPS coordinates was an uprooted tree trunk with roots attached. There were several in the primary area searched but this one was the closest to the expected target. One of the roots on this tree contained a bend in it similar to that seen in the “boot & leg” photo. A frame of the video of the root was selected and then dis-enhanced, i.e., made more fuzzy, so that it looked similar to the original photograph. Although it did not appear to be a portion of a victim as closely as the original photograph, it demonstrated enough similar features to explain the features seen in the original photograph and thus, not finding the victim in the area.

Digital Evidence, Photography Enhancement, Underwater

D13 Digital Evidence Case Report: Data Conversion on Digital Audio.wav Files

Kenneth W. Marr, BSEE, MS, MSIS, David J. Snyder III, BSET and Jeffrey L. Edwards, BSME, MSCE, Federal Bureau of Investigation, Engineering Research Facility, Building 27958A, Quantico, VA 22135*

After attending this presentation, attendees will recognize and use methods to decipher corrupted .wav files and restore the files to be used as forensic evidence.

This presentation will impact the forensic community and/or humanity by demonstrating techniques for recovery and conversion of digital audio files are essential for examiners who work with digital audio evidence. Additional awareness of these safeguards helps to improve the quality of forensic exams of all examiners who use digital evidence.

Digital Evidence has been recognized as a forensic discipline by the American Society of Crime Laboratory Directors, Laboratory Accreditation Board (ASCLD/LAB). Since many forensic disciplines already use digital techniques for specific procedures unique to those disciplines, this designation of digital evidence as a separate discipline highlights the importance of safeguards needed when using digital evidence techniques. This case study reviews methods and procedures used to recover digital audio .wav files which were corrupted and unreadable. This type of audio file is prevalent in the industry and has started to frequently appear in case submissions.

Digital audio .wav files were received and were not readable using standard desktop computer applications. The digital files of this case were generated by a 911 communications logging system but were garbled and required audio enhancement, although the files could be played back on the originating 911 system. However, all attempts to playback the files in the FBI Audio Lab caused computer default errors. The techniques used to successfully recover the audio files and convert them to readable .wav files are reviewed.

With the pervasive nature of forensic digital evidence, there are general procedures and safeguards which may be taken to ensure that the evidence is handled properly. Several industry groups (for example, the Scientific Working Group on Digital Evidence) have published

documents which are valuable resources for forensic examiners involved with digital evidence. This case report will also review techniques to recover, preserve and store digital audio evidence.

Data Conversion, Audio .wav Files, Digital Evidence
D14 SWGIT Presents: Part 1 - Does Your Forensic Imaging Unit Need Accreditation as a “Digital Evidence Unit”?

Richard W. Vorder Bruegge, PhD, Federal Bureau of Investigation, ITD, Forensic Audio, Video, and Image Analysis Unit, Building 27958A, Quantico, VA 22135*

The goal of this presentation is to provide guidance to the forensic community regarding issues relating to imaging technologies and laboratory accreditation. Attendees will better understand whether their imaging units - whether forensic photographic units, forensic image analysis units, or forensic video analysis units - should seek accreditation under the Digital Evidence discipline.

This presentation will impact the forensic community and/or humanity by guiding the forensic community relating to issues of forensic imaging, digital evidence, and accreditation from the Scientific Working Group on Imaging Technologies (SWGIT). Lab managers, quality assurance personnel, and imaging scientists will learn the SWGIT position on how digital imaging and image analysis relates to other disciplines such as computer forensics and forensic photography.

The Scientific Working Group on Imaging Technologies (SWGIT) was created in 1997 by the Federal Bureau of Investigation to provide guidance to the law enforcement community by developing recommendations for good practices in the use of imaging technologies within the criminal justice system. It consists of more than forty imaging professionals drawn from federal, state, and municipal law enforcement organizations, as well as academic institutions. SWGIT work products are not intended to represent the formal policy of any one agency, but, instead, represent a consensus opinion developed by individual experts from a broad sampling of agencies and experiences.

Laboratory accreditation is an issue of great importance to the forensic science community. In the United States, some forensic laboratories are required, by law, to have formal accreditation. In such cases, a failure to achieve accreditation may result in the closure of the facility. Many laboratories are not required by law to achieve accreditation, but choose to pursue this status as one means of establishing their credentials within the field.

Recently, a major accreditation organization - the American Society of Crime Laboratory Directors, Laboratory Accreditation Board (ASCLD/LAB) - recognized “Digital Evidence” as a forensic science discipline in which laboratories could seek accreditation. Included within this discipline, ASCLD/LAB identified three subdisciplines: (1) computer forensics; (2) audio; and (3) video and imaging. This was done with the recognition that the fundamental education, knowledge, training, and experience required to perform forensic examinations in the three subdisciplines of “Digital Evidence” are distinctly different. However, a number of laboratories remain uncertain over how to handle their photographic and video units within this context.

Some of the questions being asked within the imaging and digital evidence communities include the following: Should forensic photographic units seek accreditation under the Digital Evidence discipline? Would it be appropriate to do so? Does the inclusion of “Video and Imaging” under the same discipline as “Computer Forensics” mean that computer forensics examiners are automatically qualified to conduct examinations on video and imaging evidence? Do evidentiary images and videos need to be processed by computer forensics examiners? Do forensic photographers, or individuals engaged in forensic image or video analysis, need to be qualified in the field of computer forensics? Since “Video and Imaging” is identified as a sub-discipline of “Digital Evidence”, are examinations of analog videotapes

or film negatives not considered a part of this discipline?

The SWGIT has developed a number of positions regarding these issues. Specifically:

1. The fundamental education, knowledge, training, and experience required to perform forensic examinations in the three sub-disciplines of Digital Evidence (computer forensics, audio, and video and imaging) are distinctly different. For example, individuals conducting computer forensic examinations require competency in such areas as computer systems architecture, operating systems, and storage devices. Individuals conducting image and video examinations require competency in such areas as photography, optics, image capture, and image processing. Therefore, individuals qualified to conduct examinations in one of the sub-disciplines must not be assumed capable of conducting examinations in another.

2. Units engaged in forensic image analysis and/or forensic video analysis seeking accreditation through ASCLD/LAB should do so in the sub-discipline of video and imaging, which is currently included in the discipline of Digital Evidence. This holds true whether original evidentiary items under examination are in digital or analog form.

3. It is not appropriate for forensic photographic units to seek accreditation within the discipline of Digital Evidence unless they perform forensic image or video analysis.

4. Accreditation issues relating to imaging functions performed in accredited disciplines (such as latent prints, questioned documents, DNA analysis, etc.) should be addressed within the accredited discipline, and not within the Digital Evidence discipline. For example, an image enhancement used to improve the visibility of ridge detail in a latent print exam is an intrinsic component of the latent print exam, regardless of whether it is performed on a computer or in a wet chemistry darkroom. The same holds true for image enhancements used in the discipline of questioned documents to improve the visibility of a faded signature.

Note that the means by which a particular laboratory handles the issue of accreditation will depend upon the type of work performed by the unit under consideration. Most photographic units will not need to seek accreditation under the discipline of digital evidence. Other units may find that digital evidence is the only appropriate discipline for accreditation. The purpose of this presentation will be to provide SWGIT guidance on this and related issues, as well as to solicit feedback from the community regarding the issues raised in this presentation.

Digital Evidence, Laboratory Accreditation, Forensic Image and Video Analysis

D15 SWGIT Presents: Part 2 - Forensic Image Processing, Repeatability, and the Myth of Bit-for-Bit Duplicates

Richard W. Vorder Bruegge, PhD, Federal Bureau of Investigation, ITD, Forensic Audio, Video, and Image Analysis Unit, Building 27958A, Quantico, VA 22135*

After attending this presentation, attendees will provide guidance to the forensic community regarding issues relating to image processing activities and to provide examples regarding how multiple techniques may be used to generate the same result.

This presentation will impact the forensic community and/or humanity by demonstrating to forensic community digital image processing need not be replicated on a bit-for-bit level for purposes of repeatability. Since different techniques may be applied to images to extract the same information, and since differences in display techniques (i.e., prints versus video monitors) do not alter the information content of an image, quality assurance guidelines need not be set to require bit-for-bit duplication of processing steps.

The Scientific Working Group on Imaging Technologies (SWGIT) was created in 1997 by the Federal Bureau of Investigation to provide

guidance to the law enforcement community by developing recommendations for good practices in the use of imaging technologies within the criminal justice system. It consists of more than forty imaging professionals drawn from federal, state, and municipal law enforcement organizations, as well as academic institutions. SWGIT work products are not intended to represent the formal policy of any one agency, but, instead, represent a consensus opinion developed by individual experts from a broad sampling of agencies and experiences.

The American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB) recently voted to recognize "Digital Evidence" as a discipline under which forensic laboratories may be accredited. Included within this discipline was a subdiscipline identified as "Video and Imaging." This fact, along with the ubiquity of digital cameras in general, has led some to assume (wrongly) that all imaging functions can and should be performed using computers. What is worse, this has led some in the forensic community (including some laboratory quality assurance personnel) to assume that, because a computer is used, one should be capable of duplicating every image produced in a bit-for-bit fashion. The purpose of this paper is to demonstrate the fallacy of such an argument and to provide guidance regarding the meaning of "repeatability" in an image processing environment.

During a recent murder case in Broward County, Florida, a latent palm impression on a piece of duct tape that had been photographed in 1996 was at issue. When originally examined, the latent impression could not be identified. In 2001, however, after processing of the original film negative using commercially available digital image processing software, the palm impression was identified as belonging to a suspect who was subsequently charged with the murder. In hearings before and during the trial, the defense challenged the use of digital image processing in this case as "junk science" because the technique utilized did not lend itself to an exact, bit-for-bit, pixel-for-pixel duplication. Fortunately for the forensic science community at large, and the forensic imaging community in particular, the judge in this case denied the defense motion to exclude the palm print evidence and upheld the use of the technology and the technique in this case.

The specific technique utilized in this case was a digital version of the "dodge and burn" technique that has been utilized in traditional photographic darkrooms (including crime laboratory photographic darkrooms) since the creation of negative films over a century ago. The technique relies upon the selective underexposure ("dodging") or overexposure ("burning") of areas that would otherwise be too bright or dark on the final print. There are actually numerous techniques that can be applied to produce adjustments to the relative brightness and contrast within an image. For example, most traditional photographic darkrooms have the ability to adjust the contrast of an image simply by using specially sensitized photographic papers and different filters. Likewise, most digital image processing software packages offer several different tools or operations which can be used to adjust the brightness and contrast of an image. In fact, in the Broward County case above, the FBI Laboratory utilized a straightforward brightness adjustment to raise the latent impression, after which an examiner made an independent identification of the suspect's palm.

The key factor in this situation is that despite the different approaches used to process the latent impression, the same result was achieved - an identification of the suspect. In other words, the result of the processing - the ability to perceive features necessary to identify the suspect - was repeatable, even though different procedures were utilized. This is a critical issue for photographers, imaging scientists, and laboratory quality assurance personnel to recognize when implementing procedures within their own laboratories.

In general, forensic image processing activities are undertaken to permit the viewer of the image to extract information from the scene that was less apparent prior to the enhancement. For example, a dark image depicting the back of an automobile may be lightened to permit one to

read the license plate number. Likewise, an overly bright image of a bank robber's shirt may be darkened to allow one to read the writing on his T-shirt. If it is possible to process such images to reveal details not immediately observable in the original image (as in the Broward County case above), then there are probably multiple ways in which one can do so. In such cases, the specific techniques selected by the imaging expert to process the image will most likely depend upon the expert's knowledge, training, and experience. Furthermore, the resulting images will not be precise bit-for-bit duplicates of one another, but will differ from one another in easily measurable ways. This paper will provide multiple examples to demonstrate this.

Other factors, such as fundamental differences between display monitors and printers, should also be considered when addressing the issue of repeatability in image processing activities. One can recognize that a digital image displayed on a monitor contains the same information as a printed version of that image. This is despite that fact that, from a physical sciences standpoint, the two images are completely different. It is not insignificant to note that many court rooms in the United States today are equipped with devices that permit the jury to view projected versions of printed photographs rather than look at the image directly. Furthermore, the Federal Rules of Evidence has long accepted the position that a photographic print made from a film negative is to be considered an original - identical to the negative. Given these observations, laboratory managers should take care when preparing quality assurance requirements lest they unnecessarily restrict the flexibility of their individual experts to perform image processing operations and related functions.

Forensic Photography, Image Processing, Forensic Image Analysis

D16 Detection and Identification of Rhinoceros Species by Specific Primers

Kuo-Chuan Wu, MS, Ministry Justice Investigation Bureau, PO Box 3562, Taipei, Hsin-Tien, 231, Taiwan*

After attending this presentation, attendees will understand the use of the primers quote from the paper to identify the parts and products of Rhino.

The community may be encouraged to design species specific primers to detect parts and products of wildlife.

Rhinoceros are the first animals listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which prohibits the hunting, trading and use of endangered species. In Chinese traditional medicine, powder of Rhinoceros has long been acclaimed by herbalists as a cure for fever and used as an ingredient in a range of products, most often in the form of tablets and herbal teas, although blocks or raw horn have also been found. Owing to the over exaggerating curing effects and huge profit, it was smuggled continuously, although there is also a strict wildlife conservation law here in Taiwan to prohibit the trading of the parts or products of Rhinoceros.

There are currently a series of tests that can indicate the possible presence of Rhinoceros horn powder, including immunology test of keratin, electrophoresis of horn protein extraction and microscopic observation of horn surface structures. More definitive tests include FINS system with cytochrome-b sequencing and the comparison to the national database.

But these kinds of identification methods were not going to work if the specimens were a mixture of more than two different species or there were more than two species of Rhinoceros horn powder put together, the peaks of ATGC spelling would be mixed up, resulting in much more difficulty for sequencing the species differentiating segments of cytochrom-b DNA. A more efficient and confirmative method should be developed to resolve the problem and enhance the law enforcement.

There are five endangered species of Rhinoceros, *Ceratotherium simum*, *Diceros bicornis*, *Rhinoceros unicornis*, *Rhinoceros sondaicus* and *Rhinoceros sumatrensis*. A pair of primers for amplifying consensus DNA sequence of 12S rRNA of mtDNA was designed to confirm the existence of Rhinoceros DNA. The primers have been tested on a range of different animal parts and products. DNA extracts only give a PCR product in the presence of Rhinoceros horn powder.

For the purposes of determining how many species are in a powder, Rhinoceros species specific primers were also selected and then compare the sequence to the DNA database using the FastA method. After electrophoresis of the multiplex PCR products by using ABI 310, peaks of different dyes for each specific species of Rhinoceros could be detected without ambiguity, for example for *Ceratotherium simum* blue dye peak 351bp long would be found, for *Diceros bicornis* yellow dye peak 351bp long would be found, for *Rhinoceros unicornis* green dye peak 376 bp long would be found, etc.

The Rhino-specific and Rhinoceros species specific primers could be an efficient method for detecting parts and products of Rhinoceros.

Rhinoceros, Products of Wildlife, DNA Detection

D17 Alcestis: Bridging the Gap Between Morbidity Research and Health Surveillance

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The goal of this presentation is to present an overview of Alcestis and its use in enhancing communication with other governmental agencies in with regards to instances of death.

This presentation will impact the forensic community and/or humanity by providing an overview of Alcestis; the benefits that can be obtained by medical examiners, coroners, and death scene investigators; and preliminary findings of analyses conducted from data collected by Alcestis in Michigan. The system could serve as a comprehensive source of information that can be accessed anywhere by appropriate individuals to research and track a case. Information in the database is accessed in a hierarchical fashion. In other words, login and password allow users to be privy to as much or to as little information as is necessary. Consequently, local health departments and police can be provided with the information they require without violating HIPAA compliance.

This presentation will provide an overview of Alcestis; the benefits that can be obtained by medical examiners, coroners, and death scene investigators; and preliminary findings of analyses conducted from data collected by Alcestis in Michigan.

Medical examiner and coroner investigations produce valuable information useful to health officials, the criminal justice system, and families of the deceased. Alcestis provides uniform standards for data collection and reporting procedures for medical examiners and coroners at the state or county level.

Alcestis bridges the gap between surveillance and research with the creation of an electronic system storing in-depth data on the circumstances and social factors surrounding fatal injuries and unexpected deaths. Hosted on the Internet, the database provides health professionals with a valuable tool for community health assessments, injury prevention efforts, and other statewide efforts.

Alcestis provides medical examiner/coroner offices a fully supported package that includes: secure Internet access to the on-line database, paper data collection forms and data analysis tools. Training, technical support, and quality improvements are on-going. Medical examiners and coroners benefit from Alcestis through quick and easy access to their mortality data, instant reports and the ability to share data among offices and with other colleagues.

The system consists of three components: a death scene investigation report, an Internet-based database container for medical examiner data entry, and county profile pages connected to the database that automatically aggregate and chart the data for reporting.

Additionally, Alcestis serves as an alerting mechanism for local public health departments when instances of infectious disease or bioterrorism occur. The alert can be either a simple faxable form with the proper contact information clearly presented on the top, or an e-mail containing necessary information generated to **the proper** authority. The alert feature increases the frequency and ease of communication between medical examiner offices and local and state health departments. Enhanced communication allows for a strengthened relationship between these parties and ideally gives way to increased contact on many levels: emergency preparation, disease outbreaks, and scene investigation to name a few. Today's forensic science requires the full participation of agencies and departments on all levels and Alcestis assists parties in communication and case management.

A future direction for the system includes the possibility of collaboration with other statewide systems, including the state police database. The system could serve as a comprehensive source of information that can be accessed anywhere by appropriate individuals to research and track a case. Information in the database is accessed in a hierarchical fashion. In other words, login and password allow users to be privy to as much or to as little information as is necessary. Consequently, local health departments and police can be provided with the information they require without violating HIPAA compliance.

This new technology is an enhanced tool for forensic scientists that can be used during the course of medical examiner or coroner investigations as well as serve as a communication tool for other governmental agencies including, but not limited to, local public health departments.

Interagency Communication, Injury Surveillance, Mortality Research

D18 Management of Volatile Scenarios Within the Hospital Emergency Department

Barbara Spence-O'Donnell, BSN, RN and Mary K. Sullivan, MSN, RN, Carl T. Hayden VA Medical Center, 650 East Indian School Road, Phoenix, AZ 85012*

The goal of this presentation is to outline the elements of a Code Green Response Program and to demonstrate its value in the management and control of behavioral crises and interpersonal violence within the Emergency Department (ED).

This presentation will impact the forensic community and/or humanity by identifying potentially unstable situations that might escalate to acts of violence and prompt initiation of a definitive Code Green action plan can combine to eliminate ignition factors, thus deescalating or defusing potentially dangerous situations.

The Emergency Department is the most likely hospital area to become the scene for workplace violence. Individuals experiencing a mental health crisis and those who are unable to control verbal and physical aggression are thrust into a confining space with many other ill and injured patients. Psycho-social problems, mental illness, alcohol and drug abuse, frustrations associated with access to medical care and physical illness often combine and eventually reach an ignition point within the hectic environs of the ED.

During busy times, workloads are heavy, patient waiting times may be excessively long and human stress tolerances reach the limit. Furthermore, the trend to treat larger numbers of mental health patients on an out-patient basis results in their migration to Emergency Departments when they become overly anxious, seriously depressed or perceive a loss of control. Many medications for patients with

conditions such as hypertension, thyroid problems, neurological disorders and pain can also aggravate certain adverse behavioral phenomena. With the right combination of precipitating events, ignition factors and loss of self-control, violence will erupt and anyone within the area can be seriously injured or killed. The abilities of staff members to anticipate potentially unstable patients at triage, and to take definitive steps to defuse anger and aggression are vital in preventing catastrophic consequences for patients and caregivers.

Unique knowledge and skills possessed by forensic nurses make them ideal candidates for workplace violence task forces and response teams. They are acutely attuned to detection of suspicious circumstances and promptly recognize a dangerous scenario. In addition, forensic nurses are accustomed to working collaboratively with other disciplines. Perhaps most important however, is that from their clinical acumen, they know that violence can quickly escalate from verbal abuse to homicide. Unlike most other healthcare personnel, forensic nurses actually believe that workplace violence is a real threat to their safety and life.

This poster will present the criteria for initiation of the Code Green Response and illustrate the specific roles and responsibilities of medical and nursing personnel, hospital police and others who combine to control patient behavior, limit the zone of danger and protect patients, personnel and others from acts of violence, hostage scenarios, and emotional terrorism. The provisions of regulatory guidance (Joint Commission for Accreditation of Healthcare Organizations, Occupational Safety and Health Act), federal statutes, and other applicable laws will also be addressed.

The Code Green Response Program as well as specific staff education and training have resulted in successful management of impending and actual volatile scenarios at the Carl T. Hayden Veterans Affairs Medical Center. Exemplary case studies will be illustrated. An environmental assessment tool, including the hospital environs and community social pattern, will be suggested as a significant component of an initial planning strategy for developing a response to workplace violence.

Code Green Response, Workplace Violence, Forensic Nurses

D19 Emasculation: Auto-Inflicted Wound or Aggression

Florent Trape, MD, Service of Forensic Science, Chu Rangueil TSA 50032, Toulouse, 31059, France; Philippe Birmes, PhD, MD, Department of Psychiatry, CHU Purpan Casserladit Place du Dr. Baylac, Toulouse, 31059, France; Norbert Telmon, MD, and Daniel Rouge, MD, Service of Forensic Science, CHU Rangueil TSA 50032, Toulouse, 31059, France*

After attending this presentation, attendees will learn that specific injuries need assessment of auto aggressive behavior.

Around 21 hours 30, the firemen bring to the University Hospital of Toulouse a forty-year-old man to take care of a hemorrhage due to a complete emasculation. The surgical operation consists on a cleaning of the wound and a joining of the cutaneous plan. The following day, the services of gendarmerie intervene to question the victim. He describes an attack by two unknown individuals when he was changing the tires of his car following a puncture on the roadside. The individuals threw him in a ditch and attached him to a tree. They placed an opaque bag on his face. The victim thought that they used a cutter like weapon for the emasculation. He would then have lost consciousness for a few minutes. Then he would have gone to the roadside where he would have been taken in charge by some passers by who took him to the hospital.

This type of wound is rare most of the time in the context of gangland killing.

The medical examiner established a descriptive certificate of the wounds the following day at the request of the legal authorities, where

he noted the absence of wounds on the level of the wrists and the ankles. The examination of the skin highlights the presence of two separated testicles, associated the scrotal skin, the rod would not have been found on the spot.

The victim, with his request, profits from a psychiatric consultation two days after his aggression. He is married, the father of three children, follows the occupation of house painter, does not have particular toxic practices, and will initially evoke the absence of conflict concern with a third person.

The contact is of good quality, without thymic collapse, without productive symptomatology of the psychotic line, without structured depressive symptom. The study of the antecedent does not reveal anything notable on the psychopathological level other than one month imprisonment for voluntary violence in his youth. No psychiatric care was initiated, thus, he would never have recourse to the psychotropic treatments.

During initial questioning, regarding the action to be taken with his children, of the image which his close relations of him will have when they know the nature of his wound, we didn't notice any emotion. Four days after the aggression, he is again heard by the legal authorities, after a long interrogation, he ends up acknowledging that he auto-inflicted his wound. He is the subject then of a new psychiatric evaluation where he appeared relieved and reassured to have evoked these facts with the policemen.

The successive talks will make it possible to update a conjugopathy evaluating for many months, the scenario of an amputation of a body lying dormant already for 4 months.

With the question of the choice of the emasculation, a very particular amputation, the answer will remain pragmatic and concrete, the interested party arguing that the amputation of another member would have bothered him in his professional life.

Such a passage to the auto-aggressive act apart from any delirious and depressive structured symptomatology appears to us to have to be studied within the framework of hospitalization, hospitalization in psychiatric medium which the interested party accepts.

Let us note that the day after his hospitalization, in front of the psychiatrists of the service of reception, he revealed that it was the pressure of the gendarmes which had obliged him to acknowledge an auto-castration but that he was in fact the victim of an aggression as he had initially evoked.

The interest of this case is to share the medico-legal data and the psychiatric talks data in order to conclude on the origin of the castrating gesture, while respecting the professional secrecy.

Emasculation, Self-Injury, Mental Disorder

D20 Utilizing Forensic Nurses in the Postmortem Sexual Assault Examination: One Medical Examiner's Perspective

Stacey A. Lasseter, MSN, RN and Karen Kelly, MD, Harris County Medical Examiner's Office, 1885 Old Spanish Trail, Houston, TX 77054*

The goal of this presentation is to demonstrate advantages of using Forensic Nurses to conduct the post mortem sexual assault examination

This presentation will impact the forensic community and/or humanity by demonstrating the impact forensic nurses can have in the post mortem sexual assault examination. The forensic nurse brings to the post mortem examination a myriad of knowledge and techniques that will enhance the documentation of findings. Medical examiner/coroner offices should consider incorporating forensic nursing services into the post mortem sexual assault examination.

Sexual assault is a crime broadly characterized as any unwanted sexual contact, including rape, incest, molestation, fondling or grabbing and viewing or participating in pornography. Each state defines rape

somewhat differently, but most include the following 3 criteria: 1. any vaginal, oral or anal penetration by a penis, object or other body part; 2. lack of consent, communicated by verbal or physical signs of resistance or if the victim is unable to consent by means of incapacitation because of age, disability or drug or alcohol intoxication; 3. threat of or actual use of force. For several reasons, an accurate number of sexual assaults in the United States is difficult to determine. Recent studies have shown that approximately 1 out of every 6 women in the US (18%) has been the victim of an attempted or completed rape in her lifetime.

In order to standardize for prosecution collection of appropriate forensic evidence in cases of rape, emergency departments have begun to routinely utilize forensic nurses and their specific training and materials. In many large centers a sexual assault examination conducted by a forensic nurse has become the standard of care. Training of forensic nurses includes evidence collection and preservation, injury identification and documentation and expert witness testimony. In addition to kit collection and a routine pelvic inspection, Toluidine Blue Dye, colposcopy photography and alternate light source use are but a few of the specialized techniques used in these cases by the forensic nurse.

In medical examiner/ coroner offices, the examination process in suspected cases of sexual assault normally involve kit collection and pelvic inspection without special attention, tools or documentation techniques. To our knowledge, the use of forensic nurses to document sexual assault in post mortem cases is a rarity. Beginning in 2002, the Harris County Medical Examiner's Office in Houston, Texas began using forensic nursing services. The major component of the forensic nurse's role is to conduct post mortem sexual assault examinations. To date, approximately thirty post mortem cases have been evaluated in our office. We will present data, including control cases, showing the types of injuries documented, laboratory results from the collection of kits and the improved identification of the subtle exam findings using Toluidine Blue Dye.

Forensic nurses, trained in a clinical environment, have extensive experience in gynecologic evaluations and examinations. They bring this background knowledge with them to the post mortem sexual assault examination and can provide a spectrum of techniques to enhance demonstration of assault-related findings. Their use augments the medical examiner/ coroner's ability to determine the role sexual assault may have played in the cause and manner of death. As expert witnesses, their testimony lends significant weight to the outcome of criminal prosecution of sexual assault/ rape homicides.

Sexual Assault, Forensic Nurses, Toluidine Blue Dye

D21 The Forensic Science Program at Baylor University: A Successful Experiment

Erin Slinkman, Baylor University, PO Box 97370, Waco, TX 76798*

After attending this presentation, attendees will have knowledge of an undergraduate forensic science major and what it entails.

This presentation describes the opportunities afforded to me as a Baylor student majoring in forensic science. The Baylor forensic science major became a reality in October of 1999. The program was originally designed to give premed students hands-on experience in a multidisciplinary approach. The day the program began 35 biology and chemistry majors declared forensic science as their major.

The university hesitated to establish this program and gave it four years to graduate fifteen majors. One immediate question from the administration was "Is this a fad?" attributed to the emergence of many forensic-related television programs showing at the time. As the president of the Forensic Society, I have found that 80% of our students do not watch these shows. Although many initial majors applied to medical school, there are now a significant number of students solely interested in a career in forensic science as a result of exposure to this

program. There are currently 350 majors, and we have graduated over 200. Yes, the program is a success! To manage the growing number of forensic science majors, Baylor has created the classification of 'Pre-Forensic Science.' A student must complete 30 hours with a grade point average of 2.75 in order to declare forensic science as a major. Then, the student may start enrolling in the core forensic science classes, such as Crime Scene Investigation, Human Osteology, and Forensic Anthropology.

The Baylor Forensic Science program provides experience beyond the usual classroom lecture and encourages students to get into the field for forensic experience. After taking classes such as Human Osteology and Forensic Anthropology, a Baylor forensic science student may become a part of the Baylor Forensic Team (B.F.T). When law enforcement agencies call upon Dr. Susan Wallace, the program director, for assistance, the Baylor Forensic Team often accompanies her.

We consider ourselves as highly trained individuals able to distinguish human and nonhuman skeletal material. Since 1999, team members have spent many hours searching for human remains in tall grass fields, canyons, 30 feet deep wells, and steep hillsides. We see these team activities not only as opportunities to fulfill a commitment to service but also to gain forensic experience should we choose not to attend medical school but continue on specialized subdisciplines in forensic science. In addition, majors must complete twelve hours of internships. The internships are extremely varied and tailored to each individual's special interest.

Since enrolling in Baylor in the fall of 2000, I have had numerous opportunities for specialized internship training through the Baylor Forensic Science Society. I have taken an introductory Hostage Negotiation class taught by retired Detective Dominick J. Misino from the New York City Police Department. Through this class, I had the opportunity to listen to actual negotiation tapes, as well as practice role-playing negotiation with modern equipment. I also participated in a Blood Spatter Interpretation seminar, taught by Rex Plant of the Washington, D.C. Police Department. In this weeklong seminar, I used human blood for experiments. I learned about spatter patterns, such as cast off, droplets, and impressions and how different angles and heights of attack affected blood droplet patterns. I enrolled in a Blunt Force Trauma workshop given by Dr. Steve Symes from Mercy Hurst College in Pennsylvania in which I viewed examples of trauma to human bones and skulls. Actually getting to see real examples of trauma helped bring forensic cases and pictures into reality. The last internship I completed was a Forensic DNA Analysis class taught by Dr. Lori Baker at Baylor University. I learned the basics of forensic DNA analysis including how to extract and amplify mtDNA from buccal swabs, run electrophoresis gels, purify gel and complete a yield gel to quantify the actual amount of DNA. I received instruction for performing an ETOH precipitation, which prepared the DNA for analysis using a base sequencer. I learned how to read a sequencing sheet of the coded DNA base pairs. Through this class and my other internships, I have been exposed to different subdisciplines of forensic science and have gained invaluable knowledge to apply in future endeavors. In addition to these internships, Psychological Profiling, Forensic Photography, Medicolegal Death Investigation, and Forensic Entomology are also offered to forensic science majors at Baylor.

Some of the most memorable and valuable experiences I have received as a student in the Baylor Forensic Science program centered on the forensic cases in which I have been actively involved. I have learned different techniques for the searching for human remains in different physical settings. My first case concentrated on the recovery of human remains located in large mounds of dirt and gravel. I have descended into wells to search for human remains, walked areas of landfills in 110° heat searching for a missing woman, and walked miles along an interstate highway searching for a human cranium. My peers before me recovered a serial killer's first victim. The case that has meant the most to me is the recent search for one of our Baylor University basketball players who was

the victim of a possible homicide. Although this event saddened me I felt I was helping to bring closure to a grieving family.

Choosing forensic science as a major has provided me special skills and knowledge that I could not have received in my regular premedical classes. As an undergraduate I have been able to apply classroom knowledge at actual field situations. From what I have learned and observed as a direct result from my participation in this program I believe I have gained a level of maturity and experience that will serve me well as a future professional. I recommend this program for anyone planning a medical career or a graduate program in forensic science.

Forensic Science, Forensic Science Undergraduate Major, Forensic Science Education

D22 Survey of the Adopt Situation of Polygraph Identification by the Court of Appeal During the Period of 2002 in Taiwan

Lee Chen, MS, Fuh-Kuo Lee, BA, and Fuh-Kuo Lee, BA, Scientific & Technical Research Center, Investigation Bureau, Taiwan, ROC, 74, Chung-Hwa Road, Hsing-Dien City, 100, Taiwan, ROC*

After attending this presentation, attendees will understand the application of lie-detection on the court system in Taiwan.

For the forensic community in Taiwan, this gave a foundation on the future research work of the cooperation relationship between court and the forensic lab (the new litigation law with a overall cross examination process is applying from October this year). For the other country, it is a good presentation to explain one of the reason why the polygraph test can be used in trial in Taiwan.

After the Survey of 100 appeal court cases related to polygraph identification, we have evaluated the adopt rate about the variables of detection theory, legal category, overrule reason, questioned rate & the power level of co-evidences, and through the analysis, we found some trends are good for future reference on the use of polygraph identification in the court system of Taiwan.

All the cases are randomly sampled from the case report of Taiwan High Court, and the periods covered the entire year of 2002. Through this survey and the analysis on all variables, we found there is a high rate of adoption on the polygraph identification by the court in Taiwan. About the different of detection theory, more court prefers the memory and response impact theory than the interrogation theory. For the overrule reason, most rejections are reasoned by lack of other co-evidences, the reason of against the logical speculation is the second. The questioned and contended rates are not as high as our original prediction, we think it is because most of the examnants are examined voluntarily, that means the screen processes for the qualify of examnants are in highly validity.

This is the first attempting to make understanding on the application of the polygraph test in this country. Because the litigation process is going to change on all trial court from September of this year, the cross-examination will be applied on the new process. This is a revolutionary change and no doubt for the strong impact on forensic evidence identification, the lie-detection identification also include. On this crucial time, the result of this research is good to open a new door for the future research work on the application of the polygraph identification in this country.

Polygraph, Litigation Process, Taiwan

D23 Nicole Brown Simpson: From Threat Assessment to Lethal Domestic Violence -

What Can We Learn From Her and Other Victims of Abuse?

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After attending this presentation, attendees will gain a greater understanding of the threat assessment process, the analysis of domestic violence crime scenes and the prediction and possible intervention in domestic abuse cases.

This presentation will impact the forensic community and/or humanity by providing a greater understanding of the analysis of domestic violence scenes, the assessment of the various types of threats and an assessment of the type of individuals who are likely to abuse or be abused.

On June 12, 1994, Nicole Brown Simpson attended her daughter's dance recital at Paul Revere Middle School with her family. The event was followed by a family dinner at Mezzaluna Trattoria, and ice cream at Ben and Jerry's. OJ Simpson was not included in the celebration. He made it perfectly clear that he was furious! He was a man who was not used to rejection!

Following the festivities, Nicole and her children returned to their home at 875 S. Bundy Street. A short time later, it was discovered that Nicole's mother had left her prescription glasses at the restaurant. Ronald Lyle Goldman, their waiter at Mezzaluna, found the glasses and offered to drop them off at Nicole's residence, since Bundy Street was on his way to his after work date. Nicole sent 9-year-old Sydney and 6-year-old Justin to bed, drew her bath and waited for Goldman to drop off the glasses before she slipped into her tub. Sometime around 10:00 p.m. neighbors heard Nicole's Akita barking. Nicole sustained stab wounds to her neck and head and her throat had been slashed. Ronald Goldman sustained approximately twenty-five stab and incised wounds. A left glove and a stocking cap were discovered at the scene. Bloody Bruno Magli shoe prints were noted, walking away from the bodies toward the alley behind Nicole's residence. Blood drops were discovered on the left side of the shoe prints. A limousine driver was waiting in front of OJ's house on Rockingham Avenue to drive him to the airport at eleven p.m. for a late flight to Chicago. Kato Kaelin heard a thud against the air conditioner in his room. The bloody right glove was later discovered at this location. OJ Simpson's white Ford Bronco was impounded while he was still in Chicago. Blood that matched OJ, Nicole and Ronald was discovered on the driver's door, front seats, the steering wheel and the console. Thirty-nine drops of projected blood were discovered on one of the socks OJ wore on the night of the murders and nineteen drops were discovered on the other. Cuts were documented on a finger on OJ's left hand. Simpson was later arrested following a 60-mile slow speed chase on 405 with his friend Al Cowlings in Cowling's white Bronco. The media recorded this drive from the air and each overpass of the highway, as OJ sat in the passenger seat, holding a gun to his own head. A jury found O J Simpson not guilty of the criminal charges. A civil jury later heard the same testimony and found him liable for the murders, awarding the Brown and Goldman families 33.5 million dollars.

Could this tragic crime have been prevented? Why did Nicole remain married to OJ Simpson from 1985 to 1992 in spite of her claims that OJ had abused her for most of their marriage? What could she or other victims of domestic abuse do to participate in their own safety and survival? What can authorities do when a victim reports abuse and violence on numerous occasions but repeatedly returns to the abuser and refuses to prosecute? Why do victims of domestic violence remain with their abuser? How can authorities tell if the threat is real and the victim is truly in danger? What is the obligation of the psychiatric community

to report patients who confide victimization or violent intentions and what information regarding their patients must they reveal? And finally, are individuals who have celebrity status treated differently by law enforcement and the legal system? These are a few of the many questions that will be addressed by the three presenters in this joint session. The murder of Nicole and Ronald will be used as an example of the worst case scenario possible, along with numerous other case examples from the case files of the presenters.

Threat Assessment, Domestic Violence, Intervention

D24 “Viking Funeral” — Ritual Murder or Suicide?

Robert J. Morton, MS, FBI - National Center for the Analysis of Violent Crime, FBI Academy, Quantico, VA 22135*

This presentation is designed to highlight the many components of equivocal death investigations, through the presentation of an unusual case.

The question of homicide versus suicide is the central issue involved in equivocal death investigations. These inquiries are approached as homicide investigations for obvious reasons. Equivocal death investigations are, by their very nature, complicated, and emotionally intense because of pressure from the surviving family members, and the community. Investigators, and medico-legal professionals face many challenges because of the lack of clear and convincing evidence.

The FBI's National Center for the Analysis of Violent Crime (NCAVC) is routinely consulted by federal, state and local authorities in a variety of cases of violent crimes, especially bizarre or repetitive homicides. NCAVC assistance was requested by local authorities in regards to a case involving the possible suicide of a 22-year-old male victim.

The victim was discovered by his girlfriend in a utility shed behind her parent's residence where the victim and girlfriend were residing. The victim suffered from a single gunshot to the forehead. The crime scene appeared very bizarre to the investigators and the victim's family. The contents of the shed, including a lawnmower, and other garden implements, had been removed. The interior of the shed had a number of objects placed in it, including rugs, religious figurines, and candles. The scene was arranged very carefully, with the rugs placed in the middle of the floor, surrounded by the various religious figurines and candles. The victim was found lying on the rugs, dressed only a pair of shorts, and had a cross with a circle scratched onto his chest. The door to the shed was closed, and his shoes placed neatly outside the door.

The gunshot wound was caused by a .38 caliber bullet, fired from a Smith and Wesson handgun which was found next to the victim's body. The entrance wound had a circumferential marginal singed abrasion with an accompanying 1/4 inch soot ring encompassing the wound. There was also a second soot ring surrounding the first soot ring. It appeared to be a contact shot. A deformed lead bullet was recovered in the left cerebellar hemisphere. The bullet path was front to back, and slightly left of midline. A toxicological drug screen was negative for any commonly used or abused substances.

The coroner ruled the cause of death was a penetrating contact gunshot wound of the head, with the manner of death undetermined.

Investigation revealed the handgun belonged to the victim's girlfriend's father and was kept in the residence. There was no suicide note found.

There was conflicting background information on the victim regarding suicidal tendencies. The victim was normally “emotionally” upset several times a week, but was not on any medications, nor was he participating in any therapy or counseling. The victim had not previously attempted suicide. The victim did not have any life insurance policies. The victim was unemployed, and did not have a criminal record. The victim's

sketch book was located after the incident, and contained several drawings with bizarre themes.

The victim's family did not think the victim would commit suicide. They were aware of future plans he had for marriage, and returning to college the following fall. The victim had also offered to perform a number of household chores for his parents later that week. The victim's parents were concerned the victim may have been killed in a “ritual” murder.

The issues in this case highlight the difficulties faced by law enforcement and medico-legal death investigators in dealing with equivocal death investigation, including determining despondency, locating indicators of suicide, and eliminating the possibility of a staged homicide.

Equivocal Death Investigation, Suicide, Despondency

D25 Identifying the Unknown — The Role of the Forensic Odontologist

Barry E. Lipton, DDS, 11200 Seminole Boulevard, Suite 108, Largo, FL 33778*

After attending this presentation, attendees will understand 1. the statistics involving missing persons and unknown remains and the role of the Forensic Odontologist, 2. how information is placed into the NCIC System and the problems associated with inaccurate information from untrained resources, and 3. Case Studies: a. A cold case involving a missing teenager and a Jane Doe buried for almost 19 years; b. 17-year-old antemortem dental records of a 14-year-old missing female and a 31-year-old Jane Doe.

This presentation will impact the forensic community and/or humanity by increasing the awareness of problems associated with inaccurate dental evidence in dealing with Missing and Unidentified persons.

How important is the timely identification of unknown remains? In cases involving a death, little progress will be made without first establishing the true identity of the deceased.

In this country, there are approximately 100,000 missing persons on record in the National Crime Information Center database and only 5% of these missing persons have supplemental dental records included in their files. Nationally, there are approximately 5,000 people listed as unidentified in the NCIC database, of which 90% are adults. Of the close to 5,000 unidentified, only 68% have supplemental dental information.

Case Study #1/A Statistic: On Monday May 7th, 2001, Detectives from the Pasco County Sheriff's Office contacted me, asking if I would assist in reviewing dental information related to a teenager who had been missing for almost 19 years. They had reason to believe that the remains of a Jane Doe, buried in a neighboring County in 1983, may be those of their missing teenager. A review of the 1979 dental x-rays, chart and NCIC form for the missing teenager, showed inaccurate entries on the submitted NCIC form. Dental x-rays, the postmortem dental report and NCIC information for the unknown were not available for review, as they were lost. Although some similarities were noted when comparing the dental records of the missing teenager and the charted postmortem (1982) remains of the unknown, several inconsistencies were noted in the initial comparison. However the Sheriff's Department elected to proceed with an exhumation.

The unknown from Manatee County was exhumed on June 13, 2001. The skull and dental structures were separated from the remains, re-examined, re-charted and x-rayed. A significant finding during the re autopsy was that teeth originally reported as not present during the 1982 autopsy, were found among the remains. One of which, the Maxillary Left Central Incisor, had a unique pin retained porcelain restoration, previously uncharted.

This presentation will review the results of the dental comparison of the postmortem records with the dental evidence of two cases involving missing teenagers: the problems associated with inaccurate dental charting; NCIC submissions; lack of proper dental records and radiographs; and problems when duplicate copies of the original dental

D26 Underwater Crime Scene Investigation: A New Frontier in Forensic Science

H. Dale Nute, PhD, Florida State University, 4750 Collegiate Drive,
Panama City, FL 32405*

After attending this presentation, attendees will become familiar with the capabilities and limitations of underwater crime scene investigations and the legalities concerning their conduct.

This presentation will impact the forensic community and/or humanity by demonstrating considerable ignorance, misinformation, and confusion which currently exists about the capabilities and limitations of crime scene examinations and the proper protocol for conducting them. Some of these misconceptions will be corrected.

The necessity for recovering evidence from underwater sites is unquestioned. Everything from plane crashes and boating accidents to the disposal of bodies, cars and weapons involved in crimes requires some sort of crime/accident scene processing. There are, however, several questions about how to recover it. These questions involve pragmatic, scientific, safety, and legal issues.

Pragmatically, can evidence of value be recovered after having been exposed to water? Not only can many types of evidence be recovered and valuable information inferred, some types of materials may actually be better preserved than if left in the open on land for the same length of time. In many cases, however, much of the evidential information is lost or destroyed by marine organisms or the water itself. Proper recovery techniques are as important for underwater evidence as for land evidence, if not more so.

Scientifically, is there any requirement for examination beyond just collecting the items of evidence? In many cases no, but in many other cases yes. Like all other potential items of evidence, an object's evidential value depends on the questions or issues in the case. In most cases, documenting the scene underwater provides the same type of information for the case investigators and the jury as does documenting a case with measurements and photographs on land. In other cases, the process of recovering an object will severely compromise its evidential value and an underwater examination is imperative before collecting it.

Safety-wise, how safe is the recovery of evidence? Again, that depends on the nature of the scene. Some are simple for investigators trained to work underwater. Others absolutely cannot be processed by a diver and if the scene is to be processed, some form of technology will be required. A variety of technology is currently being developed to aid the underwater investigator even in routine investigations.

Legally, what is required to conduct an investigation underwater? Underwater operations are sufficiently hazardous that OSHA imposes rather severe regulations to assure the safety of commercial divers. For reasons of exigency, an exemption to the regulations is provided for Public Safety Divers to conduct search and rescue operations or to locate and stabilize the scene of a crime or accident. To process the scene, including the recovery of evidence, however, requires either a commercial diver or a scientific diver. Scientific diving also has an exemption that allows for prolonged investigations and the collection of data and specimens. Additional training and administrative requirements are required to meet the criteria of this exemption. The purpose for the task, not the task itself,

establishes whether it falls under the regulations for scientific diving or commercial diving. A scientific diver with proper training and equipment performs many of the same tasks in marine biology and nautical archaeology as commercial divers do in other types of work. These are essentially the same tasks required of underwater crime scene investigators, the specimens just happen to be human and the sunken ships just happen to be recently sunk.

If crime scene investigation is a science, then a crime scene investigation conducted underwater should meet the requirements of scientific diving. This means that the underwater crime scene investigator must also be a qualified forensic scientist as well as a competent diver. The emphasis, however, is on investigator and scientist, not diver. Diving is merely a means of getting to the job site.

Underwater Crime, Scientific Diving, Underwater Investigation D27 Use of 3D Computer Animation to Evaluate Complex Shooting Events

Parris Ward, JD and Carley C. Ward, PhD, Biodynamics
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CA 90272*

The goal of this presentation is to present to the forensic community a method for visualizing complex shooting events using 3D animation software.

This presentation will impact the forensic community and/or humanity by demonstrating how 3D computer animation was used successfully to better understand a complex and high-profile shooting event. In the future, they may use this tool to aid in their own analyses.

This presentation will examine how 3D computer animation was used to evaluate a complex and controversial shooting event. A man was killed when he was shot multiple times in the back by a police officer. A reconstruction of the event using 3D computer animation demonstrated how the event occurred.

A police officer investigating a noise complaint at a large Halloween party observed what he believed was a narcotics transaction. Standing in the backyard of a Hollywood Hills home, he looked into a bedroom window. Inside the darkened bedroom he saw three men making an exchange. When he illuminated the individuals with his flashlight, one of the men pulled a large handgun from his waistband and turned and pointed it at him. The officer reacted by drawing his gun and firing it nine times at the man through the glass panes of a French door.

The man fell to the ground and subsequently died from his injuries. The autopsy showed the man had been hit by four rounds. Three were in his back, and the other was to the back of his head. It was discovered that the man, an aspiring actor, had been holding a fake gun. The gun was a movie prop. The event immediately became controversial and received considerable attention in the media.

This particular incident would be difficult for the average person to conceptualize due to its complexity. Multiple shots were fired at various angles in a short period of time, and both the officer and the man were moving at the time. Computer animation allows one to visualize the complex interaction of objects with regard to time and space. Thus, it is an excellent tool for analyzing this kind of event.

Three important factors had to be considered in reconstructing the shooting: the paths of the bullets, the motion of the man who was shot, and the timing of the firing sequence.

To determine the bullet paths, a shooting reconstruction was conducted at the scene. The five shots that missed, hit the bedroom wall and a closet door. These bullet holes had been subsequently repaired, however repairs were clearly visible so the location of the holes could still be determined. The original French door had been preserved and was reinstalled with bullet holes in the glass still intact. By correlating the bullet holes in the glass with those in the bedroom walls, the paths of the bullets could be generally defined. Three-dimensional measurements were then taken of the scene and bullet hole locations using a surveyor's

total station.

Next, a shooting exercise was conducted at a firing range. The same officer was told to draw his weapon and fire nine rounds in response to a visual cue. He was told to assume the same posture and step backward while firing, as he did the night of the incident. Several tests were recorded using high-speed video at 500 and 1000 frames per second. The tests showed that the officer was able to fire all nine shots in less than two seconds.

The officer and an eyewitness both stated that the man turned toward the officer and pointed the prop gun at him. However, in order for the shots to have hit man's back, he must have turned away during the event. A videotape was made of an individual pointing a gun as described and then suddenly turning away. The tape was used to determine a reasonable rotation speed for someone turning away from a threat.

Using this data, a computer animation was created. The shooting scene was modeled on the computer using a 3D animation program. This type of program allows the user to accurately define and visualize objects in 3D space. Once a scene is created, bullet paths through space can be defined.

Human-like computer models, called mannequins, were scaled to match the dimensions of the officer and the man. They were then placed in the scene according to witness statements. Bullet paths matching the descriptions in the autopsy report were plotted through the body of the mannequin representing man. (It should be noted that such mannequins are idealized representations of humans. Some torso and extremity dimensions may differ from those of the actual people involved, just as dimensions vary between individuals of the same height. Also, the mannequin's torso does not bend the same as a human's since it is made up of articulated polygons. However, a good approximation of human body positions is possible.)

By correlating the bullet paths through the body with the officer's line of fire, it was determined that the man had to bend at the waist and rotate to his left, presenting his back to the officer. The variation in the angles of shots laterally indicated that the man was in motion when he was shot. The vertical angle of each shot to the torso indicated that he was bending over as he rotated. His body position at the time of the head shot could not be determined because of the head's ability to rotate independently of the body. The timing of the shots was based on the data recorded at the firing range. The rotation speed for the mannequin representing the man was based on the videotaped reenactment.

The resulting 3D computer animation was a real-time visualization of how this event likely occurred.

Computer Animation, Shooting, Firearms

D28 Polygraph Testing and the Effect and Detection of Deliberate Manipulation of Physiological Data: An Assessment of the State of the Art in Polygraphy and in the Practice of the Forensic Sciences

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After attending this presentation, attendees will learn what the available research reveals about the effect of physiological and psychological manipulations on polygraphic data when the Control Question Technique (CQT) is administered. The CQT is the most common approach to instrumental credibility assessment ("lie detection") in the U.S. The emphasis in this session will be on presentation of polygraphic data showing how deliberate manipulations influence recorded signals and how readily available technologies enhance manipulation detection.

This presentation will impact the forensic community and/or humanity by demonstrating a better understanding of how polygraphy and practices in that field fit within general practices in the forensic sciences.

When polygraph testing is carried out using the CQT a subject's physiological responses to a set of "control" questions and a set of relevant (crime/event related) questions are compared in order to determine the subject's truthfulness. Simply stated, more consistent and pronounced responses to control questions than to relevant questions, leads to a decision of truthfulness whereas consistently greater responses to relevant than to control questions produces a decision of deception. Persons who are lying about relevant questions, however, may employ "manipulations" during a CQT to try to "beat the testing." This can be done in one of two ways. First, physiological responses to relevant questions may be suppressed, relative to control question responses. Second, physiological responses to control questions may be "artificially" enhanced. In either instance, the result is intended to show greater responses to the control than to the relevant questions in order to change the outcome from "deception indicated" to a "no deception" indicated result. This produces what is termed a false negative outcome, an actually deceptive person being reported as truthful.

The effectiveness of deliberate manipulations on CQT outcomes is not well established. Laboratory, "scripted event," studies reported to date have examined the effect of mental and physical manipulations. In one study, it was reported that 37% of the "guilty" subjects who were trained to use either pain or another physical activity, or both, were able to defeat the CQT. In addition, 25% of the guilty subjects in this study, who were specifically trained in the use of a specific cognitive activity were also able to defeat the CQT. In an earlier study, however, it was found that guilty subjects who were trained in the use of a "method acting" procedure were unable to alter the outcome of their CQT examination. In this study all "guilty" subjects were correctly detected.

Considered together, the available laboratory studies suggest that "guilty" subjects may avoid detection with the CQT if they have specific prior knowledge of the testing conditions and, importantly, if they are given intensive practice in applying specific manipulations. This is and has been, of course, a concern in the polygraph examiner community. And, it is seemingly even more important today. There are now sites on the World Wide Web, accessible to anyone with a computer, which post reasonably accurate information about polygraph testing and about methods that might be used to defeat specific applications of such "tests." Moreover, a recent report on Polygraphy by the National Research Council of the National Academy of Sciences highlighted the need for scientific scrutiny of the likelihood that polygraph testing outcomes may be affected by deliberate manipulations of examinees.

If examinees' efforts to manipulate polygraphic data can be readily detected it would be assumed that their effect would be minimized, perhaps even nullified. However, laboratory-based research suggests that attempts to detect deliberate manipulations of polygraphic data may be only moderately successful. This finding is in direct conflict with many anecdotal observations and some systematic, field-based reports of practicing polygraphists. Based on the data offered in this paper the weight of the evidence favors the position of field examiners.

In this presentation the research findings on the use and effects of manipulations of polygraphic data will be presented and discussed from two perspectives. The first of these is how such manipulations relate directly to the practice of polygraphy. The second, and the emphasized view, will be on how such research should be interpreted within the general context of the forensic sciences and the need for more rigorous assessment of forensic practices.

Polygraphy, Lie Detection, Credibility Assessment

D29 Do Come Over, Someone

Has Killed Father

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After attending this presentation, attendees will understand the method in which suspects respond to questioning often times provides interrogators with insights into the suspect's culpability. Investigators who are trained in interrogative techniques present challenges to the guilty, in that offenders are unaware of these strategies. The objective of this paper is demonstrate the guilt of Lizzie Andrew Borden based upon her manner of responses to subsequent questioning following the murder of her father and step-mother.

This presentation will impact the forensic community and/or humanity by demonstrating criminal interrogation which is a forensic discipline in which interrogators discover acts of deception. This presentation will demonstrate that Lizzie Borden, acquitted of murder, was in fact lying when answering relevant questions. This demonstrates the reliability of the three-step interrogation technique.

On August 4, 1892, two murders occurred in the small town of Fall River, MA. As history has recorded, Andrew Borden and Abby Borden were both bludgeoned to death with an unidentified weapon. Abby Borden died first, after suffering 19 injuries to the side and rear of her head. Approximately 90 minutes later, Andrew Borden was bludgeoned to death in the same manner, and died from 10 injuries to the left side of his face. The only known persons present during the time frame of the murders was Lizzie Borden and the housemaid, Bridget "Maggie" Sullivan. Lizzie Borden was quickly developed as the most likely suspect of the murders. The police investigation, which was cursory at best, failed to answer two important questions that supported the eventual acquittal. No murder weapon was ever definitively identified, and the lack of blood spatter on Lizzie or her clothing could not be explained.

Police and court officials questioned Lizzie Borden on four occasions. Her manner of responding is typically found in instances where interrogators use a technique known as the "three-step interview." This particular technique demonstrates that a suspect is practicing deception when answering specific questions. This technique requires that the suspect provide an initial free and uninterrupted statement surrounding the circumstances of the incident under investigation. The second step consists of randomly chosen facts for clarification. Step three requires the suspect to reiterate the circumstances of the incident. It has been seen that deceptive suspects fail to maintain consistency and accuracy during the third step of this technique.

To support the theory that Lizzie Borden was guilty of double murder, the scene was compared to Lizzie Borden's inquest testimony. Analysis of the testimony, as compared to the trial testimony of other witnesses, revealed that Lizzie Borden reacted in the same manner as other suspects when confronted with interviews similar to the three-step interview process. In the end, Lizzie Borden's statements concerning the murders began as her initial version of the murders, to mixed and questionable, to a different version. Truthful witnesses rarely have problems reporting the same information three times. In addition to the weapon and blood questions, Lizzie Borden's inquest testimony, which was the proof of her deception, was not permitted into her criminal trial.

Lizzie, Borden, Murders

D30 Medical Evidence in Sexual Offense Trials: A Two Year Audit of Data Relating to Expert Witness Testimony of Forensic Physicians in Sexual Offense Trials

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The goal of this presentation is to present information about medical evidence in sexual offence trials to facilitate an understanding of the forensic role of the doctor providing services to patients who allege sexual assault.

This presentation will impact the forensic community and/or humanity by demonstrating how information about medical evidence in sexual offence trials provides a valuable insight into the forensic role of the doctor in this setting and has the potential to inform both the medical and legal professions for the ultimate benefit of the courts and in the interest of justice.

Patients who allege recent sexual assault in metropolitan Perth, WA, are seen by a group of 10 doctors who are trained in aspects of clinical forensic medicine and who provide 24 hour medical and forensic services to approximately 400 alleged victims of sexual assault per year. Sixty per cent of these patients have reported the incident to the police at the time of examination and a further fifteen per cent are considering involvement of the criminal justice system. The forensic role of the doctor in this setting involves documentation of injury on the body and in the genito-anal area, the collection of physical evidence, the preparation of a medical report detailing examination findings and their significance, and expert witness testimony in court.

This paper will present data relating to over 160 subpoenas and 80 court appearances by doctors over the two year period from July 2001, to June 2003. Three quarters of these subpoenas were for the District Court, and the remainder for preliminary hearings and the Children's Court. Data collected include duration of time from examination to trial, opportunity for pre-trial discussion between lawyers and doctors, time spent by doctor in the witness box and specific issues the doctor was questioned upon.

The average time between examination and the doctor's appearance as a witness was 21 months. All trials involved pre-trial discussion between the doctor witness and lawyer (prosecution +/- defense). The average length of time the doctors spent in the witness box was 40 minutes, with the length of evidence varying from 10 minutes to 2 hours. Doctors were questioned about genito-anal injury in forty five per cent of trials, general injury to the body in thirty per cent of trials and history given to them by patient and the patient's demeanor in ten per cent of trials. This paper will present details on these and other medical issues which the court sought information about.

Sexual Assault, Medical Evidence, Forensic Physician

D31 Quantitative Characterization of Tool Marks for Comparative Identification

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The goal of this research project is to measure surface roughness as a means of identifying features such as toolmarks.

This presentation will impact the forensic community and/or humanity by demonstrating If successful, this process should yield a forensic technique that is rapid, easy to perform, applicable to any shaped surface, and has the potential to be automated for automatic matching. By providing quantitative data the method answers the challenges created by the Daubert decision. The instrumentation needed for the method, while somewhat expensive, should still be affordable to many state and regional laboratories.

This paper will present initial results of an effort to provide the forensic community with quantitative, scientific, statistical data that supports the current comparative identification of bullet striations and toolmarks. This study is designed not to replace the current method, challenged in courts as being "unscientific" (see 1993 *Daubert v. Merrell Dow*), but to supplement the method with scientific data. The overall

goal is to provide local, state, and federal law enforcement officials with statistically valid data that supports examiner testimony and is suitable for courtroom presentation.

Current examination relies upon qualitative examination of a surface and optical matching of a pattern across a region that essentially is two-dimensional in nature. This project extends the characterization of tool marks from a two-dimensional qualitative examination to a three-dimensional quantitative one.

In the proposed method the surface is examined optically and regions of interest identified using conventional comparative examination techniques. Replicas are then made of the 'evidence' and 'standard' surfaces, the regions of interest identified and the resulting replicas are characterized using a three-dimensional profilometer. This instrument uses a finely balanced stylus to measure the topography of the surface over a user-defined area. The resulting data from the 'evidence' scan is then matched to the 'standard' scan and statistically evaluated to determine a probability of fit using a computer program.

In order to be useful it must first be shown that replicas produced using commercial materials and resins do accurately replicate the intended surface, and that these replicas can be accurately and consistently measured using a profilometer. Initial experiments have shown that, to within the specifications of the instrument, replicas are an accurate reflection of the surface and that multiple scans produce only slight changes in the surface. Current efforts are now aimed at developing the computer match routine that will take the quantitative data, automatically align the 'evidence' and 'standard' scans, then compare them statistically to determine an order of fit.

Tool Markings, Quantitative Characterization, Automatic Identification

D32 Multiple Fatality Planning: Managing Mass Fatalities From a Variety of Causes, Including a Potential Bioterrorism Threat

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After attending this presentation, attendees will understand a model for effectively dealing with a mass fatality incident at a provincial or state level, and to review the recent Toronto SARS experience as a model for a potential bioterrorism threat.

This presentation will impact the forensic community and/or humanity by assisting coroners and medical examiners who may be faced with the task of coordinating a mass fatality recovery operation. The Ontario model is based on an Incident Command structure and focuses on many of the critical areas that must be managed effectively in such an event. The development of this model has been assisted by field experience gained by our members in a variety of different settings: SwissAir Flight 111 crash, Eastern Ontario Ice Storm (2000), World Trade Centre, Bali Nightclub Bombing, Toronto SARS outbreak (2003). The SARS outbreak in Toronto serves as an excellent model for how an evolving bioterrorism incident, such as smallpox outbreak, would be effectively dealt with.

Because the scope of emergencies vary, and most are managed at the local community or municipal level, there is the potential for a catastrophic event to overwhelm the capacity of local authorities to carry out the extensive operations necessary to respond in a timely and appropriate manner. A multiple fatality incident could be such an overwhelming event, and hence the Ontario Provincial Multiple Fatality Plan has been developed to provide a structural framework for a systematic, coordinated and effective response in those circumstances.

Aimed at establishing mutual cooperation and assistance between agencies and organizations of varying jurisdictions, the plan allows for

the investigation, reporting, recovery, identification, examination and disposition of human remains. Under the *Coroners Act*, coroners in the Province of Ontario investigate all unnatural deaths such as those where accident, suicide, foul play or suspicious circumstances may exist. Most mass fatality incidents would likely fall within the coroner's jurisdiction.

The authority for implementation of the Plan rests with the Chief Coroner for the Province of Ontario. Once initiated, a control group of senior administrators will be quickly convened to oversee operations in a number of different areas, including incident site investigation, morgue and forensic pathology operations, antemortem and postmortem records management, family liaison and assistance, liaison with other governmental disaster management agencies, and international liaison (where required), and media relations.

Although the traditional focus of mass fatality plans in the past has been on reacting to incidents such as plane crashes, explosions, or natural disasters, recent history has taught us that chemical, biological, radiological and nuclear events are also likely possibilities. These threats pose interesting and unique challenges to the safety and well-being of emergency responders, recovery personnel, and death investigators, including coroners, medical examiners, pathologists, and morgue assistants.

Careful consideration must be given to dealing with potentially contaminated remains, including those that may pose a threat of infection. Temporary morgue facilities or, as a minimum, a secure containment area may need to be established. In the early stages of an incident, autopsies may be necessary to establish the medical cause of death (MCD) or to help in understanding the etiology, or they may be able to assist Public Health officials in planning strategies for containment or quarantine. Once the MCD has been clarified, further autopsies may be necessary only to establish identities of the decedents, or to gather sufficient forensic documentation for future court proceedings.

The recent outbreak of SARS in Toronto, Ontario, has provided very useful insight into the types of problems that will likely arise for death investigators in the event of a bioterrorism event, such as anthrax, or smallpox inoculation of the population. Facilities must be in place for safely carrying out postmortem examinations with minimal risk to personnel in the early stages of an incident, including appropriate negative pressure ventilation systems, protective clothing, etc.

Once the correct diagnosis has been established that would likely apply to the majority of the deaths occurring in a multi-fatality incident, which may be an instantaneous event, or may be slowly evolving, criteria may need to be established to limit the ongoing risk exposure of pathologists, morgue attendants and the like. Screening tools which can be applied by knowledgeable and experienced personnel can be useful in determining who requires a postmortem examination and who does not. Protocols must be flexible and allow for limited autopsies and sampling of only those specimens that are essential.

Communication with other agencies, families of decedents, and with the public through the media from the earliest possible moment is instrumental in maintaining confidence in government officials and allaying irrational fears and even unnecessary panic. Daily media news conferences proved very successful in the Toronto SARS experience to both inform the general public about progress in the evolution and containment of the epidemic, and to educate them about the nature of the disease and its methods of spread. This was particularly critical in a slowly evolving and ongoing crisis with this infectious disease, and would apply equally to a bioterrorism event in order to keep the public on-side and cooperative with Public Health containment initiatives.

In conclusion, Mass Fatality Planning must be flexible and take into consideration the variety and potential scope of threats that exist in our post-9/11 world. Coroners and medical examiners must be prepared to efficiently process large numbers of human remains that may be contaminated and therefore may place them at risk, and must be

cognizant of the need to keep other agencies and the public fully informed during the event.

Mass Fatality Planning, Bioterrorism, SARS

D33 A Tale of Two Toxicities: Death by Poisoning of Two Married Health Care Professionals

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After attending this presentation, attendees will understand the importance of coordination of the efforts of, and consultation among, the varied disciplines involved in the investigation of a suspicious death with ambiguous findings, and in which intimate femicide is a possibility.

This presentation will impact the forensic community and/or humanity by demonstrating an appreciation of the value of well-coordinated multidisciplinary expertise into an ambiguous death.

This case vignette will present the results of an investigation into the sudden deaths of two married health care professionals, in which extensive consultation and teamwork were required in order to determine the cause and manner of the deaths.

This young, apparently happy couple had met at university. He was a physician who had recently completed his post-graduate training, and had taken up a teaching position in a tertiary center. She was a nurse, who had put her career on hold while she raised their young children. All members of the household were previously well.

One evening in early fall, emergency services were called by the physician, who reported that his wife had become unresponsive following an apparent seizure. She was transferred to hospital via ambulance, where she was pronounced dead after resuscitative efforts were unsuccessful. The coroner was notified of the case, and, because of certain findings, police became involved, and a forensic autopsy and laboratory tests were performed. Based on initial findings and an urgent investigative case conference, all manners of death (natural, accident, suicide and homicide) were plausible, and all possibilities required careful evaluation.

Two weeks after the death of his wife, the physician died suddenly at his office. There was considerable local media attention. His death was investigated by the same team, augmented by a consultation from Behavioral Sciences, and underwent further review within the Office of the Chief Coroner.

Drawing sound conclusions about the cause and manner of these two deaths required integration of the careful collection and scrutiny of physical evidence in tandem with the professional analysis of the subtleties of human behavior. The presentation will provide an overview of the contributions of each of the investigative disciplines, the manner in which the expert work was coordinated, and the final investigative conclusions about the circumstances surrounding these two deaths.

Toxicity, Domestic, Multidisciplinary

D34 Comparative Analysis of Computer Forensics Software on IBM Compatible and Macintosh Media

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The goal of this presentation is to provide the forensic community with a sampling of the Computer Forensics software tools available for imaging and analyzing computer hard drives and storage media. The

given information in this presentation will help Computer Forensic Examiners and others working in this field to gain knowledge of applications, advantage and disadvantage of three specific software programs researched during this study and help them determine which program may work best for their needs in searching for evidence of a crime.

This presentation will impact the forensic community and/or humanity by aiding the forensic community in understanding the different forensic software available and will help them choose the best software for their cases.

This study attempts to answer three important questions when choosing software tools: 1) Can the program recognize and therefore image a particular type of storage media? 2) Can the examiner view or execute the specified test files and documents either from within the program or with an external program? 3) Can the program recognize and therefore image a Macintosh formatted storage media? The programs evaluated, scored and then subsequently rated on the aforementioned criteria.

The results shown in the Tables 1 and 2 indicate the total number of test documents and files each program was able to open, view, or execute either from within the program or with an external program.

In conclusion the present study will provide a very useful guide for the suitable program choice and proper application of the forensics software.

Table 1

RATING	PC ZIP DISK SOFTWARE TESTED	NUMBER OF OPENED FILES
1	Forensic Toolkit (FTK)	26 out of 26
2	ProDiscover	23 out of 26
3	EnCase	20 out of 26

Table 2

RATING	MACINTOSH ZIP DISK SOFTWARE TESTED	NUMBER OF OPENED FILES
1	EnCase	7 out of 26
2	Forensic Toolkit (FTK)	5 out of 26
3	ProDiscover	0 out of 26

Computer Forensics, Software Tools, Comparative Analysis

D35 Odor Analysis of Decomposition

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The goal of this presentation is to present research on the identification of molecular odorants (volatile compounds) released during decomposition of buried human remains. Attendees will become aware that human decomposition is significantly more complex than previously thought, which has implications in the training of cadaver dogs and in the detection of human remains.

This presentation will impact the forensic community and/or humanity by demonstrating research which furthers our understanding of human decomposition and has profound ramifications in cadaver dog training procedures and in the development of field portable analytical instruments which can be used to locate buried human remains.

The detection of buried human remains is often aided through the use of ground-penetrating radar (GPR), manual probing techniques or trained 'cadaver dogs.' Of these methods, the means by which cadaver dogs locate human remains is least understood as the compounds the dogs are actually alerting to are unknown.

Because of the success of canines, the science of odorology expanded to deal with the forensic applications of scent discriminating

dogs. These dogs have proved invaluable in such vital areas as explosive and accelerant detection, narcotics detection, cadaver location and searching for criminals as well as lost or missing persons. Canines have the ability to find historic human remains and the ability to discriminate human remains from those of other mammals. Additionally, dog trainers have recognized from observation of canine behavior that odor emitted by a live person differs from a cadaver and the odor from a recently deceased individual differs from one in advanced decomposition. As such, the smell associated with the stages of decomposition consists of multiple signatures. While dogs are trained to locate bodies and differentiate between human and animal remains there are limits to their abilities, in part due to environmental factors.

The current study seeks to find the basis for the canine's scent acuity by identifying the volatile compounds released from soft tissue decomposition in a burial environment and was conducted at the University of Tennessee's Anthropological Research Facility. Air samples were collected from directly below and above buried subjects (at a depth of 2.5 ft.) and also at the surface of the graves using triple sorbent traps which concentrated the volatile compounds released from the decompositional process. These samples were then thermally desorbed and analyzed using gas chromatography – mass spectrometry (GC-MS).

A total of four individuals, ranging from freshly buried to having been buried for over a decade, were monitored twice monthly for over a year. Results show that volatile compound releases from buried subjects are more complex than previously realized, with over 300 specific compounds identified to date. Additionally, the compounds released are dependent upon the stage of decomposition and the length of interment. Below-ground video capture imagery shows decomposition under conditions of shallow burial in a temperate climate to be roughly eight times slower than surface decomposition and dependant upon the season of burial. Temperature measurements of burials using below- and above-ground thermocouples showed seasonal fluctuations in temperature and indicate an approximate 12 hour lag between equilibration of grave temperature with the surface air. In addition, a 35°F disparity between summer and winter grave temperature extremes was observed.

Odor Analysis, Cadaver Dog, Burials

D36 What's That Smell? Odor Composition of Human and Animal Bone Using Gas Chromatography-Mass Spectrometry

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After attending this presentation, attendees will be presented with a comparative analysis of molecular odorants emitted by human and animal bone for potential use in the identification of indistinguishable bone fragments.

This presentation will impact the forensic community and/or humanity by demonstrating research which will further our knowledge of molecular odorants released during bone degradation and provide a database for further research on the volatile(s) used in canine discrimination of bone. The introduction of a new method of odorant sampling has applications in identification of volatiles from a variety of

trace evidence sources in addition to classifying fragmentary skeletal remains as human or animal in origin.

It is recognized that well-trained cadaver dogs can distinguish the scent of human remains from those of animals. Cadaver dogs are trained to detect generic air scents common to all human remains; however, whether they respond to an individual, or combination of compounds is unknown. Because cadaver dog can, in some instances, detect skeletonized remains, bone must release volatile compounds forming the basis for this study.

The wet-weight composition of bone is 20-25% organic, 60-65% inorganic, and 10-15% water. Protein hydrolysis in the organic matrix liberates amino acids. Further breakdown of these amino acids results in the release of organic compounds detectable by cadaver dogs enabling them to identify the location of human remains. In nature, most odors are comprised of a mixture of volatile compounds which elicit sensory properties, i.e., molecular odorants. Identification of odorants released by human and animal bone will establish a database useful for compound selection necessary for enhanced cadaver dog training.

Preliminary sampling of bone odor released by human and animal remains indicated spectral differences in composition. Subsequently, eight adult human femora (two of each: male, female, African American, European American) and a tibia or femur from 14 animals—pig, gray fox, raccoon, two dogs, bear, pig, rabbit, two cows, two deer, rabbit, and sheep—were selected from the William M. Bass Forensic Skeletal Collection for further comparison. The bones were placed in Tedlar® sampler bags and filled with compressed air where they remained sealed four to five days. Two liters of air were drawn from the bag through triple sorbent traps (TSTs), concentrating bone-released odorants. The compounds were then thermal desorbed and analyzed using gas chromatography – mass spectroscopy. It is predicted a unique odor signature specific to human skeletal remains will be found for segregation of human from animal bone.

Odor Analysis, Skeletal Remains, Cadaver Dogs

D37 A Comparison Between the Modified Griess Test and Use of Sodium Hypochlorite for Enhancement of Gun Shot Residue Patterns on Fabric

Jim A. Bailey, PhD, Ruby S. Casanova, MS, and Kim Bufkin, Cape Fear Community College, 411 North Front Street, Wilmington, NC 28401*

After attending this presentation, attendees will understand: (1) the comparison of the modified Griess test results compared to an application of a sodium hypochlorite solution as an agent for enhancing gun shot residue (GSR) powder patterns, (2) the results of the test on 12 samples of dark or multi-colored fabric, and (3) the advantages and disadvantages of using the modified Griess test and the sodium hypochlorite solution to enhance visualization of powder patterns. The purpose of this presentation is to present the results of an experiment that evaluated the modified Griess and a sodium hypochlorite solution used as a bleaching agent for the enhancement of GSR powder patterns at specific distances on dark or colored fabric targets.

Humanity demands that forensic scientists and jurists search for truth in the administration of justice. Without truth, the innocent may be punished and the guilty may be set free. This presentation will impact the forensic community and/or humanity by adding to the search for finding truth. The purpose of this research was to develop a more practical and economical method for enhancing gunshot residue patterns.

An essential element in reconstructing some crime scenes is to determine a weapon's muzzle to target distance. The determination of

this distance can be estimated based on the size and intensity of the powder pattern if the type of ammunition and weapon are known. Dark or multi-colored fabrics interfere with the investigator's interpretation of powder pattern size and intensity. Tests were conducted to enhance visualization of powder patterns on dark or multi-colored fabrics.

GSR patterns have been classified as contact, near contact, intermediate-range, and long distance based on the size and intensity of the patterns. Even though the investigator may have a known type of weapon and ammunition to test, the test firings cannot be used to establish a precise muzzle to target distance. However, in some cases the investigator may eliminate certain ranges of distances based on the GSR pattern characteristics. The GSR mainly consists of nitrates and nitrites from burned and partially burned propellant, carbon and metals such as barium, lead and antimony from chemicals used to manufacture primers. Also, there may be other trace element present in the residue depending on the type of ammunition. When a weapon is fired the propellant gases exit and materials contained in the gases are deposited on the target depending on the distance.

A model 686 .357 S&W revolver, with a 4-in barrel was used to produce GSR patterns by firing .38 caliber Winchester Western ammunition with lead round nose bullets into samples of dark or multi-colored fabric with a muzzle-to-target distance of 7.62 cm (3 in) for two groups of 12 samples. Group one of the samples was tested with the modified Griess test and group two was treated with sodium hypochlorite to compare the visualization enhancement of each method on the GSR pattern.

The materials prepared for the modified Griess test were 12 sheets of 203 x 254 mm (8 x 10 in) Kodak polycontrast RC (resin coated), type F photographic paper fixed with Kodak fixer for 10 minutes at 20°C (68°F). After fixing, it was washed in 20°C (68°F) water for 10 minutes and dried in an RC dryer. The desensitized photographic paper was then immersed in a 5% solution of sulfanilic acid for 1 minute, dried at 20°C (68°F) then immersed in a 0.5% solution of Alpha-naphthol in methyl alcohol for 1 minute and dried at 20°C (68°F). Twelve pieces of 203 x 254 mm (8 x 10 in) cotton cheesecloth were soaked in 20% acetic acid for 1 minute. Each sample of fabric was then covered with a piece of treated photographic paper with the surface of the GSR pattern adjacent to the paper's emulsion. The piece of cheesecloth was placed on the back of the fabric sample and ironed on medium heat for 1 minute. And orange color developed on the photographic paper in the presence of nitrites. The photographic paper was then washed in 26°C (80°F) water for 1 minute and then washed with methyl alcohol.

A 5.25% solution of sodium hypochlorite was sprayed onto 12 samples of dark or multi-colored fabric to determine if bleaching the fabric would enhance visualization of GSR patterns. The solution was sprayed in a mist on each piece of fabric until saturated. In 2 to 3 minutes, the fabric colors began fading and losing color due to application of the sodium hypochlorite solution. A significant amount of the color was removed with the first application, and there was an observable difference in the visualization of the GSR patterns after sodium hypochlorite was applied. After 30 minutes, the fabric was sprayed with a second application. However, after the second application, there was minimal observable change in the visualization of the GSR pattern.

The 12 types and colors of fabric tested included: red, green, and beige plaid cloth with 100% cotton, striped navy and red with 100% cotton, striped navy, white, green and red with 100% cotton, burgundy with 100% cotton, black with red floral pattern with 100% rayon, beige, black, and purple floral design with 100% rayon, black with light colored floral design with 100% rayon, navy with 100% acetate, navy with 100% wool, black with 70% triacetate and 30% polyester, black and white with 50% polyester and 50% rayon, and black with 50% polyester and 50% rayon.

The GSR patterns on all samples were difficult to differentiate and

measure on the untreated fabric. All 12 patterns developed with the modified Griess were orange in color and were measured and photographed for comparison to the patterns treated with sodium hypochlorite. Ten of the 12 samples treated by applying a 5.25% solution of sodium hypochlorite to bleach the dye from the fabric, produced enhanced GSR patterns. The 2 samples failing to yield improved visualization of the GSR patterns were the black 100% wool and the fabric containing 70% triacetate and 30% polyester. The bleach had no effect on the wool and the fabric with triacetate and polyester turned olive green but with no visual GSR pattern. The GSR patterns from the treatment of sodium hypochlorite were also measured and photographed.

The GSR maximum pattern diameters ranged from 5.5 cm (2.16 in) to 8 cm (3.14 in) for the twelve samples that were fired at a distance of 7.62 cm (3 in) with an average pattern diameter of 6.62 cm (2.60 in) for the modified Griess patterns. The GSR maximum pattern diameters for the twelve samples treated with sodium hypochlorite ranged from 1 cm (0.39 in) to 7 cm (2.75 in) fired at a distance of 7.62 cm (3 in) with an average diameter of 6.62 cm (2.60 in).

In conclusion, the use of sodium hypochlorite for enhancing GSR patterns is equivalent to the modified Griess test if the dark or multi-colored fabric can be bleached. If the dye in the fabric cannot be bleached, the modified Griess test should be considered for enhancement of the GSR pattern. One advantage of using sodium hypochlorite is that the fabric can be treated in a few minutes and the pattern is enhanced. Also, after treatment, there is an increased contrast in GSR patterns that allows routine photography of the fabric. The disadvantage of the modified Griess test is the time it takes to prepare the reagents for testing. Also noted were differences in color intensity for the Griess test possibly due to the composition of the fabrics used in the testing.

Gun Shot Residue, Modified Griess Test, Powder Patterns

D38 A New Development of the Process of Polygraph Test by the Principles of Science and Identification

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The new process we present is expected to be challenged, as long as it can pass the examination of the principle of science, we believe it is a chance to be examined by the court or academy.

This presentation will impact the forensic community and/or humanity by demonstrating the challenge of junk science on the work of polygraph testing. We believe there is enough space to modify the testing process of this technique, to meet the scientific criteria, even by court debate. This presentation may offer some new concepts on the process of the testing and we hope it will open a new direction to reconsider the scientific character of lie-detection.

Based on the basic principles of scientific identification, we have tried to modify and enhance the quality control of the process of common lie-detection (polygraph identification) work. The principles applied include; the checking and screening criteria of physical and psychological abnormality, the practice of reproducibility, the development of a new technique to understand memory more efficiently, the level divided for curve shape on GSR, and the time interval between every two questions.

Through this modified process, we found there are some good ways to change and to meet the requirements of basic scientific principle. First, a very discreet screen process is applied to screen any of the

abnormal physical or psychological situation of the examinant to get rid of all suspected countermeasure interferences. Second, through the pre-examination interview, a new method was developed to label the memory of the special event which is targeted by the detection. Then, to concentrate on the test process to avoid the decay of the contrast of the relevant and the control answers. This is a way to reach the criterion of reproducibility. For the quality control, a smooth GSR curve without any unexplainable notch are strongly demanded. And a quality control SOP was designed to regular the examination process to reach the consistency by the different examiners. On this point, our minimum requirement is the getting of GSR result has to be unified. There are also some techniques developed to reach this demand.

Since we applied this modified lie-detecting process on our identification work years ago, there are more than thousands cases have been detected for the trial court of Taiwan. The recent statistics on the high court of Taiwan showed more than 30% of the identifications were not questioned or contended by either of the two parties on the trial process. And the adopt rate by the court even higher than 60%.

Polygraph, Memory, Quality Control

D39 Establishing a Protocol Between Clinical and Forensic Institutions to Treat and Solve Violence Against Women Cases

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Most of the aggressions against women are not treated correctly because they are unknown, although it doesn't mean that their symptoms are not visible. Only 10% of the cases are reported, but 100% of the victims go to a medical institution asking for assistance for symptoms directly or indirectly related to violence. This study demonstrates this situation and the necessity to coordinate and collaborate through a protocol between Forensic and Clinical Institutions to solve medical and forensic issues and to avoid victimization.

We must break with the technical conception of Domestic Violence and to try to avoid taking a part (forensic implications) for the whole (health, social, familiar, juridical, economical, labor implications). Although we can not solve all of them, we shouldn't contribute to make more difficult the recovering of victims. It means that we should get a global approach and try to use all the resources to contribute to change the social and cultural elements that make it possible for these cases to happen. The protocol we present can help to close the gap between forensic and clinical assistance, and to increase (we would evaluate more women) and improve (we would intervene sooner) the information given by institutions.

1. Introduction

Violence against women is a crime, but not only a crime. It is a social behavior rooted on cultural values given by a patriarchal conception of society and couple relationships. It means that when a case happens, any of these cultural values arise to explain and justify the aggression. Only a small percentage of cases (no more of 10%) are reported and it means that only these victims can receive help through its institutions. However, all these women go to clinical institutions with symptoms related directly or indirectly to domestic violence.

2. Material and Methods

The study was performed in Medical institutions (Emergency service and General Practitioner Service) using different questionnaires about domestic violence (physical and psychological) and recorded social and demographic features of the patients. The sample consisted of all of the women that went to the institutions in a two-month period of time and the tests were administered by a physician during a regular consult.

3. Results and Discussion

There is not significant difference among the social and demographic features. 17.9% of this group of women (patients) reported

suffering domestic violence, but paradoxically 51.8% consider their relationships as "good" or "very good." In response to the question of whether they would like doctors to ask regularly about family and couple matters, they answered "yes" in 88.5% of the cases; and they would like doctors to ask if they suffered violence and aggression, they answered "yes" in 88.6% of the cases. But at the same time, 35% of women wouldn't report domestic violence if a doctor reported the case.

We not only need additional tests, we need to reflect about legal regulations on this subject to try to help women and solve the cases. In this sense we have to introduce a global approach considering not only the legal and forensic implications, but also the clinical ones and the health issues behind this violence. A protocol under this global perspective would; help protect women, help them to avoid victimization, solve the forensic questions, and encourage the institutions to proceed judicially for the victim and the aggressor.

Domestic Violence, Health and Clinical Implications, Protocol Between Forensic and Clinical Issues

D40 Use of Clinical Laboratory Assays in a Forensic Setting: A Review

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After attending this presentation, attendees will be better aware of laboratory methods typically used in clinical differential diagnosis that can be applied to forensic setting. A literature review will be provided at the poster.

This presentation will impact the forensic community and/or humanity by making forensic scientists more aware of laboratory options to assist in determination of cause of death. The methods discussed are typically used for differential diagnosis in the living. They may be applied to forensic investigations providing additional information to forensic investigations.

Quantitative determinations of biochemical components, such as electrolytes, glucose or serum proteins, have been used in postmortem blood specimens to aid in determination of cause of death. In a variety of forensic studies, determination of esoteric biochemical markers has been useful in establishing postmortem diagnosis of the underlying cause of death. These are the tests typically used in an emergency room setting or tests used for differential clinical diagnosis. Following is a review of some of these tests.

Procalcitonin (PCT) is a propeptide of calcitonin, with a half-life of 25 hours, and is deprived of hormonal activity. In the living, PCT has been shown to have a good correlation in the differential diagnosis of bacterial and non-bacterial inflammation. Moreover, PCT has been able to differentiate between sepsis and systemic inflammatory response syndrome of non-infectious origin. For example, in postmortem specimens, PCT levels with severe sepsis have been shown to be as high as 90 ng/ml. Non-sepsis specimens had PCT levels less than 1ng/ml. And measurement of PCT seems reliable until 140 hrs postmortem. Because of its stability and the ease of measurement by immunoluminometric assay, PCT may be a more specific postmortem marker for sepsis than C-reactive protein (CRP). Rather, CRP is more related to systemic inflammation in general, and has recently shown application as a predictor of cardiovascular disease risk. Interleukin-6 was also found to be elevated in postmortem specimens of sepsis, and can be assayed by convenient manual immunoassays. Diagnosis of sepsis is a problem that continues to challenge forensic pathologists.

Troponin is clinically routine cardiac marker. The troponin complex consists of three myofibrillary proteins (TnC, TnI, TnT) and after myocardial injury TnI and TnT are extensively released into the blood. Automated immunochemical methods, as well as point-of-care

tests, are used to measure these proteins in blood. In the living, TnI is non-detectable and has proven to be a sensitive marker for diagnosis and management of myocardial infarction. TnI measurement in postmortem specimens can provide evidence of death due to myocardial infarction (MI) and estimation of postmortem interval. Immuno-histochemical expression of TnI and TnT of postmortem cardiac tissue and their gradual decline would assist in making a firm diagnosis of MI. A rapid assay method (Roche CardiacT) designed for use in an emergency room setting, has been used to measure TnT in postmortem blood. In a study of 20 cases with final autopsy report of death due to MI, 85% were positive; and out of the 30 control cases studied only 30% were false positive. While these methods may provide quick supplemental information they are no substitutes for autopsy since they can not rule out other underlying reasons for the cause of death.

Glycosylated hemoglobin (HbA1C) is used as a marker for glycemic control in patients with diabetes. HbA1C reflects the average blood glucose level over a period of six weeks. Studies indicate that postmortem HbA1C can be an accurate marker to predict diabetes mellitus and therapeutic compliance. HbA1C specimens are reliable if stored at 4 degrees C, and temperatures from 27-35 degrees C for 7 days caused only an increase of 4-7% above original values. Levels of HgA1C greater than 8.5% in postmortem specimens indicate chronic hyperglycemia. Chromatographic methods are commonly used for HbA1C determinations. High levels of fructosamine in vitreous humor were also found to be indicative of diabetes. Insulin/C-peptide ratio may be used to make a forensic diagnosis of exogenous insulin administration especially in suspected homicide cases. Because endogenous insulin is cleared slower than C-peptide, physiological insulin/C-peptide ratio is less than one. Exogenous insulin/C-peptide ratio will result in greater than one. Commercially available RIAs are available for all of these assays.

Prostate Specific Antigen (PSA) is used clinically to detect and manage prostate disease, and is found in large quantities in seminal fluid. Several sensitive PSA immunoassays have been developed and are commercially available. Newer membrane assays are relatively easy to perform and offer similar sensitivity as immunoassays. It was reported that seminal fluid from vaginal swabs collected from sexual assault cases, even stored at room temperature for three months, could be extracted and PSA detected by membrane assays. Saliva specimens were used as negative controls. Thus, the membrane assays could be used for forensic identification of seminal fluid.

These are but a few examples of tests that could be helpful to the forensic scientist; tests that are usually thought of as clinical tests. Commercially available assays are available and offer more options in the armamentarium for determining forensic cause of death and other investigations.

Procalcitonin, Troponin, Glycosylated Hemoglobin

D41 Evaluation of Parentage Cases in Turkey

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After attending this presentation the attend will learn the disputed parentage cases in Turkey analyzed in a socio-demographic approach.

The forensic community will learn the current situation about the paternity practice in Turkey and will be informed about various socio-demographic parameters related to the subject.

Disputed parentage and specifically paternity is one of the most frequent type of testing of biological relationship performed in the Institute of Forensic Sciences of the University of Istanbul. Cases such as identifying the parents of an adopted, and possible baby mix-ups can also be categorized within the same group. Controversial cases of both

civil and criminal origin as well as private applications are being examined. Many aspects of parentage testing have changed in the past decade in our country. We see an increase in the demand for testing which may be explained in several ways. The most valid one is the tremendous amount of information about the DNA technology, its validity and reliability that passed through media to public and increased the awareness. The result of this continual publicity about DNA is that more and more testing is being requested directly by individuals without involvement of lawyers or the courts. Even the number of exhumations for this purpose has been increased seriously. In this study we performed a socio-demographic analysis of 356 paternity cases. The material used, consists mainly of information obtained by the individual consent forms of the subjects taken during the application for the analysis used in completely anonymous format and the final paternity reports. The cases have been evaluated as to the age of the mother, the child and the questioned father, the sex of the children the marital status of the couple, and the degree of the exclusion of the paternity. Additionally the civil, criminal and private applications were examined separately. The seasonal fluctuations of the applications and the applicant (the father or the mother) have also been analyzed. Some of the outcomes of the study are as follows. The 47.7% of the children to be examined found to be males. The most frequent months of applications seem to be November (19.9%), December (10.5%) and January (13.2%). The exclusion rate is 29%, which is comparable to results found in various European and North American populations. When we examined the question with which the application was done, the reason for the analysis can be classified as suspicion in first place followed by wealth problems and finally the desire to prove the legitimacy to the family, a characteristic that reflects the culture itself.

Parentage, Paternity, Turkey

D42 Vehicle Fires: Actualistic Investigations

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The aim of this presentation is to provide the forensic community with temperature data from automobile fires that can potentially be applied to investigations.

This presentation will impact the forensic community and/or humanity by providing and demonstrating data that can be utilized in vehicle investigations.

In 2001, approximately 400,000 residential fires were reported. Investigations of many of these fire scenes incorporated either computer fire modeling or actual fire testing. The foundation of these techniques is temperature data primarily derived through the use of thermocouples devices which record fire temperatures at specified time intervals. Such data can be interpreted and manipulated in order to generate situation specific information on the intensity and duration of a structure fire. Further, temperature data lies at the foundation of investigator interpretations of fire behavior and burn patterns. Undeniably, temperature data are crucial for fire scene reconstructions and for the calibration of fire model predictions, and of increasing importance is the role that such scientific and technical data play in the substantiation and presentation of fire scene investigations in the courtroom.

Although fires in single passenger vehicles are among the most common type of fire with greater than 300,000 reported in 2001, limited resources are available to aid in the investigation of automobile fires. Currently, thermocouple data is being collected on vehicles burned in conjunction with the National Forensic Academy, a ten week program

designed to educate and expose the forensic technician to procedures for identifying, collecting and preserving evidence. Overseen by the Law Enforcement Innovation Center at The University of Tennessee, Knoxville, participants are exposed to units including blood spatter, fingerprint analysis, skeletal recovery and bombs. A four day module of the course teaches techniques for the investigation of arson scenes and fatal fires, a component of which involves the ignition of an automobile, where a thermocouple device is mounted in the interior of each vehicle prior to ignition. Temperatures are recorded until cessation of burning or sixty minutes elapses. Results demonstrate a maximum temperature in excess of 1800 degrees Fahrenheit (F) was attained in each burning scenario. Of further note, in all experimental burns, temperatures exceeded 1600 degrees F in less than two minutes. As expected, variation in duration and intensity of heating was noted, yet experimentation demonstrates it can be partially attributed to vehicle model, fuel load, and environmental conditions.

To provide experience in recognizing the impact of heat upon soft tissues, several deceased animals are placed in the vehicle before burning. Following incineration, students, under the supervision of an anthropologist, recover the specimens. The partially skeletonized remains exhibit color change and fracture patterns consistent with thermal alteration. This component of the National Forensic Academy provides a unique opportunity for students while generating a growing collection of heat-altered skeletal material of known exposure, duration and temperature.

This ongoing research involving vehicle fires will ideally provide investigators, from numerous disciplines with a foundation in recognizing, detailing, and understanding the intensity and duration of automobile fires.

Vehicle Fire Investigation, National Forensic Academy, Cremated Remains

D43 Identification of *Canis Familiaris* Signature Odor Chemicals in Human Remains

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The purpose of this project is to determine the signature odor(s) of human decomposition. In addition, a comparative study will be conducted to distinguish the odor of decomposing human remains from that of the scent, which emanates from other deceased animals, including pigs. Finally, to test whether or not a human remains canine will alert solely to bone, as opposed to attached tissue or the soil in which it is surrounded.

This presentation will impact the forensic community and/or humanity by distinguishing the signature odor of human remains, as opposed to other animals, is an essential part in forensic investigation, when a detector canine is used. It is crucial that the canine is consistent in its alert and not distracted by the surrounding environment.

Distinguishing the signature odor of human remains from that of other animals is an essential part of investigation in both the law enforcement and forensic science communities. When canines are employed for search and recovery missions it is crucial that they consistently alert to human remains as opposed to being distracted by the surrounding environment. By identifying the signature odor(s), canine training aids and subsequently the reliability of both the canine and those aids could be better established.

The process of human decomposition is a dynamic one. As the body goes through its various stages of putrefaction, biological compounds are broken down and an array of scent is emitted. Other studies have tested and identified some compounds, which are believed to be sources of the odor. Some of those compounds include 3-methyl indole (skatole), 1,4-diaminobutane (putrescine), and butanoic (butyric) acid. These compounds and eleven others are currently the focus for the identification of the signature odor(s). The compounds have been separated into five categories (biological amines, alcohols/cresols, indoles, methyl sulfides and organic fatty acids).

Since most of the compounds of interest have a strong unpleasant odor, optimization methods have been developed to transfer, absorb and maintain the compounds. This process included testing different absorbent media, as well as storage containers and bags. The samples were subjected to varying conditions to best mimic circumstances encountered in the field.

Human remains canines, 'cadaver dogs,' are those that are specially trained to alert to the scent of human decomposition. The ones used in this study are actively employed and certified by the Miami-Dade Police Department. Weekly field tests with the suspected compounds, human samples and animal samples are being conducted. In an effort to avoid conditioning the canines to any confounding variables, the searching procedures have been established and are implemented by the handler. In addition, some experiments will be blind (where the handler is not aware of the presence or absence of a sample) and some will not. This will be done to help assess the amount of influence (and subsequent bias) the handlers impose on their canine partners. To date, preliminary trials have shown no indication that the canines alert to animal remains. Conversely, they have alerted to some of the suspected chemical compounds, including 1,5-diaminopentane (cadaverine), dimethyltrisulfide, and butyric acid.

In an effort to identify and quantify chemical compositions, headspace analysis of all the samples will be analyzed by solid phase microextraction/gas chromatography/mass spectroscopy (SPME/GC/MS) and solid phase microextraction/high performance liquid chromatography (SPME/HPLC). These techniques have been used in other forensic applications including identifying and quantifying narcotics, fire debris and explosives. However, their usage with regards to identifying the components of human decomposition has not yet been comprehensively studied. SPME/GC/MS analysis has revealed significantly better peak resolution when the samples undergo derivitization prior to analysis. Additionally, SPME/HPLC methodology is being optimized.

Human Remains, Animal Remains, Canine Scent Identification

D44 Discrimination of Duct Tape Samples Using FTIR, SEM/EDS, and XRD Analysis

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The analytical approach taken when comparing two pieces of duct tape to ascertain whether they may share a common origin will be presented. Examples of the discrimination power of each step within the process will be discussed. The steps will include macroscopic and microscopic observations, physical measurements, and the following analytical instrumentation: FT-IR, SEM/EDS, and XRD. After attending this presentation, the attendees will understand the importance of the sequence and discrimination power of each of the examinations.

This presentation will impact the forensic community and/or humanity by educating the forensic community regarding the differences that can be measured between two seemingly consistent pieces of duct tape. The technique of X-ray diffractometry is not commonly used in the

forensic community; a case will be highlighted that demonstrates the importance of using this technique to discriminate between two pieces. Without this technique, there is the potential to draw an incorrect conclusion regarding an association between two specimens of duct tape.

In the FBI Laboratory, comparative analyses of duct tape specimens begin with macroscopic and microscopic examination of the physical appearance of the submitted evidentiary items. The adhesive color and backing construction as well as the thickness of the film backing and the overall tape thickness are all discriminating physical features between specimens. Fabric scrim characteristics such as the number of yarns per square inch in the warp (machine) and fill (cross) directions, and the type of fabric weaves are also used to physically compare duct tape samples.

If these physical characteristics do not provide points of discrimination between items of evidence, particularly in cases where the evidence has become aged or degraded, instrumental methods of analysis can be extremely useful. In the FBI Laboratory, Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy with energy dispersive X-ray analysis (SEM/EDS), and X-ray diffraction (XRD) analyses are routinely used to analytically compare duct tape specimens. Each technique requires minimal to no sample preparation and can be performed on specimens no larger than a one-inch square. Information regarding the additives used in the formulation of both the adhesive and the backing can be obtained using all three techniques. When used in concert, the discriminating power between physically similar specimens becomes much greater.

FTIR may be used to analyze filler materials in the adhesive layer of duct tape samples. Common materials that may be identified using FTIR include: talc, clay, calcium carbonate, and titanium dioxide. The absence or presence of any of these components in only one of the specimens being compared will readily disassociate the two samples.

SEM/EDS can be used to further compare both the film backing and the adhesive layer of two or more specimens in order to determine if there are differences in the elemental composition of either component. SEM/EDS data can reveal the presence of titanium, calcium, magnesium, or aluminum, even when these materials are not apparent from the FTIR data of the adhesive. Analysis of the adhesive and backing layers separately provides the analyst with two independent points of comparison between specimens. Thus, comparable data in one layer between specimens may be countered by differences in the other layer, which would serve to disassociate specimens that might otherwise be reported out as being consistent with one another.

When a method that complements SEM/EDS, such as XRD, is added to a duct tape analysis protocol, even further discrimination can be achieved between seemingly consistent specimens. In the FBI Laboratory, XRD is used to document the mineralogical aspects of both duct tape layers, either together or separately. Common diffraction patterns that are encountered in duct tape specimens include titanium dioxide (anatase or rutile forms), kaolin clay, talc, polyethylene (film backing), calcium carbonate, and dolomite.

In the case that will be discussed, physical comparisons between a severely weathered specimen and a partial roll of duct tape in pristine condition were conducted. These examinations revealed that similar specifications were used in the formation of the blown film backing. The relative backing and overall thickness measurements of the duct tape specimens were also comparable. The fabric scrim count in the warp (machine) and fill (cross) directions indicated that both were readily available consumer grade products and the weave of the scrim depicted a weft insertion pattern. Analysis of the adhesive using FTIR indicated that calcium carbonate was present in both specimens. Neither talc nor clay were observed in either sample, and the typically prominent absorption bands for titanium dioxide were less than obvious. SEM/EDS data showed that the adhesive did contain titanium and oxygen in both samples, and a small amount of magnesium was present in the film backing of the partial roll of duct tape. However, XRD

analysis proved to be essential in this examination for it provided two important discriminating features: the form of titanium dioxide that was present in the adhesives; and, that talc was found in the backing of the partial roll of tape, but not in the questioned sample. Thus, two seemingly physically and chemically consistent specimens were determined to be different in what is often assumed to be a less discriminating feature of duct tape.

Duct Tape, X-Ray Diffractometry, Discriminating Power

D45 The 2004 Advanced Forensic Science Educators Conference

Mary Fran Ernst, BLS, Saint Louis University School of Medicine, Division of Forensic Education, 1402 South Grand Boulevard, R512, St. Louis, MO 63104*

After attending this presentation, attendees will be encouraged to offer Forensic Science Educational conferences in their communities; informing high school science and mathematics teachers of the value of utilizing forensic science scenarios to teach basic science principles; and encouraging high school students to study science and mathematics by introducing forensic sciences into their lesson plans.

This presentation will impact the forensic community and/or humanity by encouraging Academy members to offer Forensic Science Educational conferences in their communities

To explain the 2004 Advanced conference for high school science and mathematics teachers. This five-day conference will expand their forensic science knowledge and provide them with 10-14 classroom lesson plans that can be immediately used to introduce the forensic sciences to their students.

In 2000, the Third International Math and Science Study (TIMSS) was released. It reported US student achievement in the area of science and mathematics knowledge at the conclusion of 4th, 8th and 12th grade. Forty-four countries participated in this study. US students in the 4th grade were in the top quartile of the study. Those students steadily fell behind their international peers. By the end of 12th grade, U.S. students ranked in the lowest quartile of the study group.

In 2001, the Academy partnered with several universities to introduce science teachers to the forensic sciences. The initiative's goal was to establish the Academy as teachers' primary source for high quality forensic science information and education and to increase US students' interests in math and science. Two Forensic Science Educators Conferences were conducted in St. Louis and New York City. A third is scheduled in October 2003, at the University of Texas-Arlington. The two conferences that were held in 2002 provided more than 200 teachers with introductory information about many of the forensic science disciplines. These three-day conferences included presentations and workshops that assisted the teachers to utilize forensic science disciplines to entice students to study math and science. Additional conferences are scheduled in 2004 for Hawaii and Louisiana.

Teacher evaluations revealed that the conferences were extremely helpful and that their classes were increasing in enrollment. Many teachers reported that they had required a pre-requisite science class. This strategy has led to increased enrollment in introductory science courses in their schools.

With scholarship-funding from the St. Louis-based Saigh Foundation, an Advanced Conference will be conducted at Saint Louis University School of Medicine July 19-23, 2004. This five-day conference will provide three stages of instruction to teachers. The first two days will provide introductory information to teachers who have no forensic science background. The next three days will provide experienced forensic science educators with new information taught by Academy members and nationally recognized, veteran high school forensic science teachers who have successfully pioneered this effort in

their own classrooms. Details of this advanced conference will be provided during the presentation.

Science and Mathematics Teachers, Advanced Educators' Conference, Forensic Science

D46 Forensic Science in the Health Care Setting: Pitfalls and Promise

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The goal of this presentation is to present forensic scenarios that occur in health care settings which require the application of forensic principles in order for proper investigation to ensue and quality of care improvements instituted; and to discuss strategies for educating and training health care providers to recognize and respond to possible forensic situations in a health care setting.

Since it is the duty of every health care provider to ensure a high level of quality patient care and accurate delivery of such services, this presentation will impact the forensic community and/or humanity by demonstrating that health care providers should have some level of awareness of what constitutes medico-legal and forensic significance.

The Department of Veterans Affairs (VA) Office of Inspector General (OIG) has extensive experience with numerous problems relating to potential forensic scenarios — both civil and criminal — that occur in the health care setting. Clinical forensic events of a civil nature usually include basic quality and standard of care issues. Criminal forensic events that can occur in the clinic and hospital setting may include, but are not limited to, patient abuse; suicide; assault; homicide; medication-related concerns including medication or delivery system tampering, improper medication administration, and grossly negligent medication errors; medical equipment and device tampering; problems with restraints; and problems in search and rescue procedures for eloped patients. The authors present data from over 100 such cases reviews.

In order to successfully understand these events for quality assurance and patient safety purposes, and to gather necessary information for prosecutorial purposes, it is essential that the scene of a possible forensic event in the health care setting be properly preserved.

To do this, it is necessary that those involved in direct patient care have increased awareness of what constitutes a forensic situation, and that there be designated clinicians who have the forensic knowledge base to respond appropriately. Preserving forensic evidence never precludes life-saving patient care delivery; however the skilled clinician with appropriate forensic training will be able to accomplish both without compromising either responsibility.

Medical school curricula offer little or no training in these issues. In fact, sometimes, it is falsely believed that forensic sensibilities are developed at the expense of patient care. Likewise, consideration must be given to the registered nurse who is an integral part of every aspect of patient care delivery. The contributions of clinical forensic nursing to direct patient care delivery, to the case reviews conducted by Quality Management, and finally to external investigations conducted by law enforcement or other agencies should be examined. Additionally, hospital-based clinical social workers may have important contributions to make in this regard. Overall, VA OIG data suggests that is vital for every hospital have a core team of individuals who have been thoroughly indoctrinated in the discipline of forensic science, especially with specific applications to the health care environment.

Forensic Medicine/Nursing, Inspectors General, Patient Safety

D47 Improving Health Care Delivery Through Forensic Science

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The goal of this presentation is to demonstrate the value of forensic / medical evidence management within the hospital and patient care environments. This presentation will outline several cases of suspicious patient events / deaths within Veterans Affairs Medical Center (VAMC) settings.

This presentation will impact the forensic community and/or humanity by demonstrating that forensic education and training should be encouraged and emphasized at all levels within the hospital's chain-of-command, and position descriptions should be updated, listing specific forensic roles and responsibilities for the clinicians, supervisors and administrators.

Evidence identification, collection and preservation are becoming vitally important as forensic investigations increase within health care systems. One of the more pressing issues currently confronting the emergency departments and other patient care areas is the ability of health care workers to recognize possible forensic implications in routine patient care scenarios and the expertise to manage and secure the appropriate medical / forensic evidence.

Adverse patient events range from those causing minimal concern to extremely serious action, but the vast majority of these are not criminal in nature. Regardless, the precise identification, collection, and management of facts, data and medical evidence are critical, criminal or not. It is the duty of every health care provider to ensure a high level of quality patient care and accurate delivery of such services. This means all healthcare providers must have some level of awareness of what constitutes medico-legal significance. In addition, patients deserve a safe environment in which to receive healthcare, and healthcare providers deserve a safe place to practice. Failures to recognize and safeguard evidence in healthcare settings can result in medical errors, miscarriages of justice for victims or perpetrators, and result in lengthy, complex investigations.

Many healthcare facilities do not have adequate mechanisms in place to collect, package, and store evidentiary items. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) has laid the groundwork for the roles of clinical forensic nurses and other health care providers within hospitals in its published scoring guidelines for patient care assessment. Additionally, the Joint Commission includes the review of organizations' activities in response to sentinel events in its accreditation process that opens the door for closer examination of what role forensic science can play in improving health care delivery.

The Veterans Health Administration (VHA) is a leader in recognizing forensic sciences as a tool to not only improve investigatory efforts, but as a Quality Management tool in process improvement plans. The goals set forth by VHA leadership include heightening the awareness of healthcare workers of potential forensic scenarios in everyday patient care; to establish teams of clinicians indoctrinated in forensic science who will be first responders to suspicious events; and to standardize protocols in them management of medical / forensic evidence in each patient care department.

It has been established that the vast majority of law enforcement and investigative personnel are not trained to navigate through a complicated medical or surgical area, nor do most comprehend the medical / nursing jargon commonly used within medical facilities. Clinicians who have enhanced their practice with the forensic sciences and who maintain current knowledge of the justice system requirements while exhibiting the ability to apply this expertise to health care, become

the critical link between law enforcement and healthcare practice.

Medical/Forensic Evidence, Suspicious Patient Events , Quality Management

D48 The Role of the Forensic Nurse Death Investigator

Joyce P. Williams, BA, RN, 26 Grove Creek Circle, Smithsburg, MD 21783; Nancy B. Cabelus, MSN, RN*, Connecticut State Police, 294 Colony Street, Meriden, CT 06451*

After attending this presentation, attendees will understand the role of forensic nurse death investigators, their educational foundation, and training and why their employment is a natural development in medical examiner and coroner systems.

This presentation will impact the forensic community and/or humanity by demonstrating the totality of information forensic nurses provide to medical examiners and coroners in death investigations.

This presentation will outline the role of nurse death investigators, their educational foundation and training and why their employment is a natural development in medical examiner and coroner systems. Medical legal death investigation is comprised of four aspects: scene investigation, medical history, social history and the autopsy. (Fowler—personal communication) Forensic nurses are essential personnel providing vital evaluations to medical examiners and coroners that will determine the manner of death in all types of cases. The legal responsibilities of the nurse death investigator includes knowledge of state statutes, autopsy regulations, tissue and organ procurement, court testimony and legal documentation.

The number of forensic nurses working as death investigators is increasing throughout medical examiner's offices and coroner's jurisdictions worldwide. In some states, medical examiner's offices are hiring nurses as part of the investigative team and in other jurisdictions nurses are being elected as coroners. Nurses aren't only practitioners with strong backgrounds in bioscience; they also possess advanced medical and scientific expertise. Knowledge and training in medical terminology, pharmacology and pathology and the law are necessary when investigating the scene of untimely death. This applied knowledge steers the investigation when the forensic nurse interfaces with professional counterparts representing the disciplines of forensic science and law enforcement. The nurse correlates clinical findings and interprets the body's response.

Quality frontline investigation techniques are critical to the death investigation system. Contemporary death investigation systems acknowledge the importance of a functional multidisciplinary structure to achieve decisive death investigations. The nurse is a notable professional having the ability to objectively assess the medical, social and scientific background of the deceased. Nurses apply effective assessment skills, recognition and documentation of injuries, and patterns of injury useful in determining the cause and manner of death.

The correlation of the history taking: medical, psychiatric, social and occupational facilitates the investigator in the development of the sequence of events leading to the death of the decedent. Correlating this basic information with the findings noted on the body aids in the determination for further investigative efforts.

Nurses retain the ability to decode the medical record, a valuable resource of critical historical information. They also project objectivity during the review of the medical record and are able to recognize inconsistencies.

An essential part of death investigation is the conduction of interviews with witnesses. Traditionally, nurses are good history takers because the general public trusts them. This assumed level of trust helps the nurse to gather information and facts in the course of an interview.

Nurses project an image that is likely approachable, less intimidating and more calming than the image of typical law enforcement authorities. This helps build a rapport with witnesses that may be useful in follow-up interviews.

An experienced nurse with keen, clinical assessment skills may tune in to non-verbal cues during the course an interview. Such observations may help to facilitate or prompt further and necessary questioning. Forensic nurses are trained to apply a degree of suspicion when there are inconsistencies in statements made by witnesses and especially when those statements are inconsistent with findings at the scene. The application of critical thinking by the nurse is fundamental in the interpretation and communication of information in stressful situations when emotions frequently run high.

Nurses as forensic investigators obtain useful data to support interpretation of the scene. The combination of a thorough history and good crime scene processing guide the pathologist in the performance of the autopsy. This useful information will assist the medical examiner to focus on specific areas of interest. The medical examiner findings are disseminated to all members of the multidisciplinary team. The result is a comprehensive systematic and scientific death investigation.

Forensic Nurse, Death Investigators, Medical Examiners/Coroners

D49 Is Current Medicolegal Death Investigator Training Meeting the Profession's Needs?

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After attending this presentation, attendees will have an increased awareness of medicolegal death investigation training programs available throughout the country. The impact of this trend is discussed as well as the qualities that are necessary to provide good training.

This presentation will impact the forensic community and/or humanity by increasing awareness of medicolegal death investigation training programs available throughout the country. The impact of this trend is discussed as well as the qualities that are necessary to provide good training.

The past few years have brought about an increased interest in medicolegal death investigation due largely to media exposure and television programming. Many high school students inquire about baccalaureate programs in this field without realizing that education has traditionally been received on-the-job or through training courses. Until national requirements are mandated within the profession, which would allow for standardized curriculums, training courses continue to be the vehicle for knowledge. With the 1998 distribution of *Death Investigation: A Guide for the Scene Investigator*, published by the National Institutes of Justice, courses are now focusing on the 29 essential skills and standards of practice identified. Using these guidelines in place of agency specific protocols is the first step in promoting standardization across jurisdictional boundaries. Individuals who develop new training courses should always use the guidelines to structure their course content to ensure consistency.

Media attention has brought about a heightened awareness of the significant role that medicolegal death investigators play in the prosecutorial process. This awareness has helped bring about a proliferation of basic training courses offered throughout the country to teach basic medicolegal knowledge and skills, even though few states mandate any type of training for their investigative personnel. There are roughly ten basic medicolegal death investigation courses offered nationally on a regular basis. These few offerings are severely deficient to educate the thousands of medicolegal death investigators working for Medical Examiner or Coroner jurisdictions.

The lack of a central repository for educational offerings or training is unfortunate. Forensic publications, such as the AAFS Newsletter, list courses specific to medicolegal death investigation. You can also discover training opportunities by performing a simple search on the Internet. Others, however, are listed under the sponsoring university or agency and are not accessible to anyone unfamiliar with its existence because key words are not entered into a search engine. Most sponsoring agencies retain a mailing list. This is certainly acceptable but presents a problem for expanding the audience. Thus, word of mouth still seems to be the most popular method of promoting training opportunities.

There are several variations in instruction methods. The majority of training courses have a medical examiner listed as the director and are affiliated with a university. Some allow open enrollment while others are state or region specific. Class size is limited when hands-on instruction or workshops are involved, while other courses lecture in the traditional manner to hundreds. The majority of courses utilize local forensic scientists to teach basic death investigation information but some bring in guest speakers who are considered experts in their field. Costs vary from \$75 for two days to \$675 for five days.

With the evolution of technology, education is also being offered online. Community colleges and universities are beginning to incorporate medicolegal death investigation topics in their criminal justice curriculums. Even though this is an accepted method of learning, it removes the ability for registrants to share their experiences among peers in a classroom setting. Most medicolegal death investigators claim these discussions are a valuable part of the training. Perhaps online education is better suited for continuing education.

New courses that are being implemented nationally to meet the rising need for training new employees may be too basic for veteran medicolegal death investigators. Therefore, specialized training within forensic disciplines is also desperately needed to enhance the investigators base knowledge. Specific courses in bloodstain analysis, bloodspatter interpretation, forensic photography, entomology collection, etc. are currently offered but are usually limited to a specific region within the country depending on where the instructors are located.

There are certain qualities that define good training. Training funds are often limited, requiring one to choose their training options wisely. An analysis of traits will be discussed to evaluate educational offerings and determine if they meet the desired needs of the profession.

Medicolegal Death Investigation, Training, Education

D50 The Role of a Coroner's System in an Infectious Pandemic: The Toronto SARS Experience

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After attending this presentation, attendees will understand the evolving role of a medicolegal death investigation system during a pandemic caused by an initially unknown pathogen.

This presentation will impact the forensic community and/or humanity by increasing understanding of how a medicolegal death investigation system can advance public safety during an infectious pandemic by improving medical knowledge and assisting public health decision making.

Sudden Acute Respiratory Syndrome (SARS) was first publicly identified by the World Health Organization (WHO) on March 12, 2003, but in retrospect this new infectious disease appears to have started in Asia in late 2002. At the time of submitting this abstract SARS has been

identified in 31 countries worldwide. Significant outbreaks of SARS have occurred in China, Hong Kong, Singapore and Toronto. The political, economic and public health effects of this pandemic has been enormous.

The first death of a SARS victim in Toronto occurred on March 5, 2003, although its public health significance was not appreciated until just over one week later. At the time of abstract submission there have been 40 deaths (20 male/20 female; age range 39-99 years; median age 75 years) attributable to SARS in Toronto (with 13 active probable cases still in hospital).

The Toronto experience can be separated into two distinct epidemiological outbreaks (SARS I – March 5 to May 10, 2003, and SARS II – May 22 to June 12, 2003). At the time of the first deaths (SARS I) the pathogenesis and specific causative agent responsible were not known. 14 autopsies (out of 25 deaths) were performed during SARS I with the focus on medical cause of death, including testing to identify the etiological agent. All but one of the autopsies were conducted on cases with a probable (WHO criteria) diagnosis of SARS; all cases with probable diagnosis were positive for SARS based on microscopic and, when available later, PCR testing. As a result of these initial autopsies the *Coronavirus* genome was sequenced and PCR-based diagnostic testing developed. Autopsies were centralized at one site with the best ventilation and physical plant. All but 4 of the autopsies were performed by one pathologist. A protocol for a limited autopsy (including in situ organ sampling from liver, spleen, kidney, urinary bladder, heart, lung, pharynx, trachea, bone marrow and skeletal muscle) was developed during SARS I. The cranium was not opened in order to reduce aerosol formation.

The second outbreak (SARS II) resulted from transmission from an unrecognized acute care hospital inpatient; by the time of recognition 3 other health care facilities had SARS patients secondary to patient movement between facilities. By the time of SARS II *Coronavirus* had been identified as the causative agent and the focus at autopsy shifted, in large part, to using post mortem examination and test results to rule out potential (yet clinically low suspicion) cases. Autopsies were predominately performed on elderly inpatients with non-specific clinical pictures and evidence of infection, and provided important information for public health decision making (specifically identifying who required isolation). Based on experience from SARS I a new protocol was developed requiring that only the chest be opened; samples from lung, heart and skeletal muscle were examined by light and electron microscopy and PCR (reverse transcriptase PCR for SARS *Coronavirus* RNA) testing was performed within 24 hours of autopsy. Twenty autopsies were performed during SARS II (18 negative, 2 positive). Based on this new protocol it was possible to efficiently diagnose or rule out SARS cases within 24 hours of death, information that proved invaluable for public health decision making. There was one homicide case (stab wound to head) during SARS II where the decedent was febrile at the time of death and had been exposed to a SARS patient prior to death. This was the only case where a complete autopsy was performed. Test results available 20 hours after autopsy were negative for SARS.

Medicolegal death investigation systems do play an important role in an infectious pandemic, a role that may evolve during the course of the outbreak. Information gained as a result of autopsies can both advance medical knowledge and assist with public health decision making. In this instance of major public health concern the Coroners Office played a major role in diagnosis and disease containment.

Pandemic, Epidemic, Virus

D51 The Importance of Consistent and Reasoned Death Classification in the Proper Execution of a Death

Investigator's Public Duty

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David Eden, MD, Niagara Regional Supervising Coroner's Office, 301 St. Paul Street, 8th Floor, St. Catharines, Ontario L2R 7R4, Canada

After attending this presentation, attendees will learn new strategies for death classification consideration.

This presentation will impact the forensic community and/or humanity highlighting to others in the public service of death investigation, for both forensic and medico-legal purposes, that cautious, informed and reasoned conclusions are essential to maintaining public confidence as we execute our authority as participants in administrative justice and public safety.

This presentation will demonstrate the forensic and medico-legal importance of consistent and rational classification of death by coroner and medical examiner systems. The process utilized by the Office of the Chief Coroner in Ontario, Canada to achieve this outcome will be described.

As persons provided with significant powers, often usurping the wishes of family, to investigate and determine cause and manner of death, coroners and medical examiners exercise an important public duty. The process utilized by the Office of the Chief Coroner to develop by what means guidelines that are transparent, reasoned and medically and legally valid will be presented. The guidelines are based on the collective experience of senior coroners and consideration of definitions in other jurisdictions.

Death investigation in Ontario, Canada (perhaps the largest medico-legal jurisdiction in North America) is conducted by licensed physicians. Approximately 340 physicians (full time physician supervisors and managers and fee for service physician investigators) apply the principles to ensure consistent determinations in the 30,000 death investigations each year. These physicians are appointed coroners through an "Order in Council" of the provincial government following an application, interview and background screening. References are contacted to ensure good medical judgment and keen forensic and medico-legal interest.

The significance of "by what means" decisions by coroners in forensic and medico-legal death investigation will be discussed. The impact of death classification on legal matters for the deceased, the family, business associates and colleagues, the justice system and the public will be demonstrated. Utilizing the legal test of "balance of probability" in a medically based death investigation organization coroners in Ontario make these decisions cognizant of the legal, religious and societal (both private and public) impact of findings such as accident, suicide and homicide.

The definition of suicide in Ontario has been determined by a judicial decision and is stated to be death resulting from "the intentional act of a party knowing the probable consequences of what he is about" [*Beckon v. Young* (1992) 9 O.R. (3d) 256 (O.C.A.)]. The court also directed that the application of this definition also requires a "high degree of probability".

Intense scrutiny of the circumstances of deaths as a result of police action, which are often the subject of a mandatory public inquiry in the form of an inquest, has initiated close examination of the "homicide" definition in a non-culpable context. Only five classifications are open to an inquest jury: natural, accident, suicide, homicide and undetermined. No other "creative" determinations or descriptions can be returned. This principle must be applied against a strong policing initiative to avoid the "homicide" term.

Ontario has an active inquest system in which a jury of five persons is tasked with the determination of cause and manner of death following sworn evidence about the circumstances leading to the death and the active participation of parties granted "standing" at the inquest. The definitions of natural, accidental, suicide, homicide and undetermined

provided to the jury are identical to those utilized by investigating coroners. These definitions must be applied to the circumstances of the case, relying on clear and cogent evidence. No finding or implication of blame or legal responsibility can be returned by the jury in their verdict or their recommendations.

Sample investigation and inquest cases will be presented to demonstrate the application of the guidelines and discussion welcomed.

Death, Medico-Legal, Forensic Impact

D52 The Next Big Challenge for Quality Forensic Service

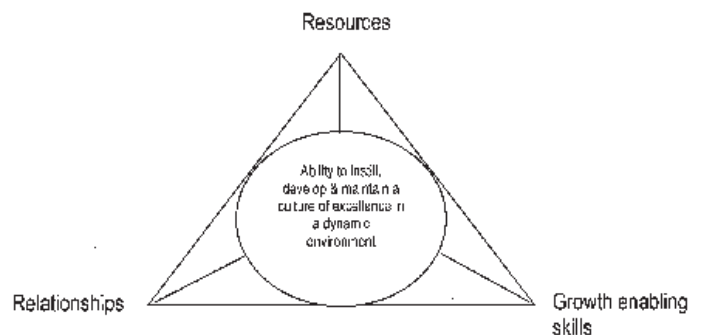
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After attending this presentation, attendees will obtain a wider understanding of quality and the organizational capabilities required to ensure a quality forensic service offering. Action plans are proposed to build these capabilities and to deal with the potential constraints encountered during implementation of a quality assurance program. Real-world illustrations will be given during the presentation

This presentation will impact the forensic community and/or humanity by demonstrating to forensic scientists whom too often adopt a narrow perspective of what constitutes a total quality assurance program. Quality management, however, entails more than focusing on technical aspects. People-related issues such as organizational culture, managerial preparation, generation and sharing of knowledge, talent management, communication and relationship management are equally - if not more important - to insure a quality program that continues to be relevant to the needs of the criminal justice system.

A forensic organization is a unique collection of highly differentiated resources, capabilities and expertise. Organizational capabilities are fundamental to performance and vital to the provision of a quality forensic service. Developing the relevant type and amount of capabilities valued by criminal justice system will help forensic organizations remain relevant and stay ahead in quality performance.

Our view and definition of quality is fundamental as it determines our priorities and allocation of resources to achieve the quality we desire. Quality has been variously defined as "innate excellence in terms of service specification," "free of errors and conform to design specification," "fit for its purpose," "meeting measurable characteristics required to satisfy a customer," and "value in relation to price." In the forensic fraternity, accreditation and certification have become buzzwords synonymous with quality. We submit that these are necessary but insufficient. There is little doubt that they impart a seal of quality to forensic organizations but a quality service delivery entails more than focusing on quality work processes and obtaining reliable scientific findings. Quality includes various other tangible and intangible assets



likely to have significant impact on the service delivery process in the long run. In parallel with our restricted view of quality, there is presently, a lack of understanding of the capabilities required for delivering quality forensic services. Heavy emphasis is continually placed on technical capabilities (the integration of knowledge and skills of forensic scientists with equipment and technology) and stringent quality assurance to provide error-free services.

Objectives

The key issues of this paper are to identify:

1. organizational capabilities needed for delivering quality services and action plans required for building these capabilities
2. potential constraints for exploiting and leveraging these action plans

The bedrock of a quality service delivery process is the ability to instill, develop and maintain a culture of excellence in a dynamic environment. This bedrock is in turn based on three key factors: resources, growth-enabling skills and relationships, which in a balanced combination, constitutes a formidable tool for insuring a total quality program. Resources include the technical capabilities and expertise as well as an integrated team of committed professionals and a wide range of management skills. Growth-enabling skills encompasses knowledge generation and sharing, experimentation and learning, creativity and innovation. Lastly, special relationships refer to vital links and ties with colleagues, clients, suppliers, and international counterparts.

Culture of Excellence

Technology is a powerful driving force in the forensic field. New technologies usher in new possibilities, new expectations and new services. Benefits sought by the criminal justice system change in importance over time. Keeping pace with these technological advances requires a constant upgrading of our instrumentation and technical capabilities. However, cultivating a learning organization that welcomes and embraces change appears to be an even more fundamental requirement. It is critical for the entire organization to be educated on the change process. We need to have correct attitudes and capabilities and be vigilant of driving forces and flexible to change. We have to align to a common vision and mission, and understand and live the core values of the organization. High caliber personnel with integrity, commitment, motivation and expertise are required to fit the bill.

Talent Management

People are the crown jewels and the most important asset in any forensic organization. Hence, talent must be deliberately managed and retained by identifying training roadmaps for staff, designing challenging jobs and creating strong teams. Adequate funds need to be set aside for training and development of forensic examiners. Learning opportunities must be planned and provided for them on an on-going basis to develop and strengthen their capabilities and for them to grow with the organization. They must be recognized for their efforts made in the investigative process. Talent management may be a laborious and sometimes painful organizational process but it will produce both short and long-term benefits in terms of succession planning or downsizing, ensuring a smooth transition to capable practitioners and leaders, or shedding of uncommitted and under-performing staff when casework volume declines in certain areas.

Managerial Preparation

Managers need to be equipped with the necessary management skills. Most organizations effectively prepare their managers in the technical domain, ensuring their ongoing professional development. Forensic agencies however, often neglect training senior staff for management responsibilities, which have greater ambiguity and require more interpersonal skills. Forensic managers also often lack knowledge and skills to apply techniques of marketing to strategically position their organizations.

Knowledge sharing and transfer

Knowledge resides in people's heads and is therefore a highly mobile resource. It is vital for top management to manage intellectual

resources and capabilities such that knowledge is transferred, stored and institutionalized. Unlike capital and physical assets, knowledge increases when it is disseminated, used and shared. Our organizations need to offer the necessary culture and support to mandate and strongly encourage knowledge behavior by evaluating people on the basis of it and rewarding those who consistently display it. We have to develop means to keep a record of the people who have the know-how to solve specific problems so that others can quickly locate them and tap their know-how when the need arises. Continual observation and careful analysis is required to convert tacit knowledge to explicit knowledge.

Communication and relationship management

The ability to network and collaborate internally and externally is critically important in forensic science. Linkages between labs create synergies, and contacts with international counterparts enable an organization to tap new expertise, benchmark its processes and systems and shorten its learning curve. International collaboration will set new heights for quality performance and enhance an organization's reputation. Lastly, an interactive and informative service encounter crowns the service delivery process. Forensic examiners need to discuss cases with law enforcers, practice progressive reporting to convey significant results and explain the implications of the final report, whether it is intended for investigation, intelligence or prosecution.

Potential Constraints

Constraints that may potentially hinder the implementation of action plans stem from 2 major factors:

1. the organization's willingness and ability to identify and develop its employees
2. forensic examiners' ability, aptitude and willingness to learn

It is not easy for top managers to walk the talk and they have to understand their own strengths and weaknesses and be honest about what they know and do not know. It is even more difficult to cultivate a culture of sharing and learning and constant alignment to the organization's mission, vision and core values.

Conclusion

The organizational capabilities perspective provides a more holistic approach to creating quality services. However, it is insufficient to simply cling onto a bundle of capabilities. Capabilities need to be constantly reviewed, modified, honed and rebuilt to keep pace with the ever-changing demands of clients and advances in technology. Forensic organizations will have to constantly reinforce the view that producing top quality work is everyone's job. The prerequisites for quality performance are excellence in learning through the relentless benchmarking of critical measures, setting stretch targets and challenging people to achieve them. Most importantly, an organization must develop the enabling infrastructure, ideologies, resources and capabilities to support and deliver this goal.

Forensic Service, Quality, Organizational Capabilities

D53 The Role of Forensic Science as a Tool Against Violence — The Colombian Experience

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After attending this presentation, attendees will understand the importance of Interagency and International Cooperation.

This presentation will impact the forensic community and/or humanity by demonstrating active participation in the implementation of criminal policies. The importance of interagency cooperation and of sharing information. Interconnectivity among law enforcement agencies.

The purpose of this paper is to show to the audience the importance of implementing an interagency cooperation strategy, as well as the key role of international cooperation, both of which have been critical to the enormous scientific progress accomplished in Colombia for the benefit of law enforcement agencies, police officers, investigators, and prosecutors.

Historically, Colombia has been affected by high violence and crime rates. Criminal activities, such as drug trafficking, insurgent and paramilitary actions, kidnapping, human rights and International Humanitarian Law violations, and common crime have increased significantly in the last 15 years.

All of the above, together with a weak criminal judicial system and a strategic geographic location, have contributed to Colombia's position as a target of international assistance, aimed at solving these endemic problems.

Therefore, as part of the so-called Plan Colombia, an assistance program implemented by the United States, the U.S. Department of Justice, through its agency ICITAP (International Criminal Investigation Training and Assistance Program) promoted cooperation for the development and enhancement of Colombian Forensic Sciences, as a collaborative strategy to support both investigators and prosecutors in their daily fight against the scourge of crime.

Traditionally, the criminal justice system in Colombia has been inquisitory in nature, following the European continental model. This is an obstacle to the submission of evidence by defense attorneys. The defense relies solely on the official evidence submitted by the government. This situation was aggravated by the fact that the crime labs of the law enforcement agencies acted on their own and there was no cooperation among them. This is an obviously obstacle to successful results.

The audience will see that crime rates have declined significantly in Colombia, as a result of a joint effort and will find a clear-cut link between crime reduction and investigative and forensic developments.

The paper will describe the operation of the forensic database interconnection system through the wireless networking of law enforcement agencies in various Colombian cities. Successful investigations will be used as examples of the key role of enabling information sharing among agencies. The Colombian reality of interconnectivity will be described.

Case studies concerning the use of DNA will show how the CODIS system was the tool that helped investigators solve the case of a serial rapist and arrest a rebel leader. These cases were made possible by the fact that investigators had the immediate support of the forensic experts who operate the IBIS database. Other cases concerning the identification of counterfeit drugs through the image databases shared by Questioned Documents Labs will also be described.

The Colombian experience is an example for the international forensic community. It is an evidence of how forensic scientists, concerned with the destiny of their homeland, may become both leaders and trainers who promote, design, recommend, and actively participate in the implementation of policies and strategies against crime.

Information Sharing, Interagency Cooperation, Violence

D54 A Heavy Grasshopper Infestation Creating a Delay in Blow Fly Oviposition on a Suicide Victim During Summer in Montana

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Gary Dale, MD, Montana State Medical Examiners Office, Forensic
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After attending this presentation, attendees will understand that there could be delays in insect oviposition caused by heavy infestations of grasshoppers in certain portions of the United States.

This presentation will impact the forensic community and/or humanity by obtaining a more precise postmortem interval.

The use of insect evidence to answer questions surrounding a death scene is becoming a common practice across the U.S. Conclusions made by forensic entomologists are based upon known behavior, biology, and growth and development of many insect species that interact with decomposing animal carrion in a predictable pattern and sequence. In most cases, there is little which will alter or affect this known succession or pattern. However, as with all trends in natural science, there are a few exceptions. Normally, when a body is placed in an outdoor environment and the temperatures are adequate (50°F or greater) blow fly female adults will initiate colonization within minutes of death. The postmortem interval estimate is based upon the oldest life stages present of a specific species of blow fly. In Texas, heavy populations of fire ants in close proximity to decomposing carrion (pigs) altered what would be recognized as the start of the initial blow fly colonization. Fire ants were observed feeding on and carrying off early depositions of blow fly eggs faster than the blow fly females could accumulate any sizable egg masses. It was nearly 48 hours after placement of the dead pig before the blow flies were able to begin an accumulation of eggs that would produce the first hatching larvae. Therefore, the estimated time of death based upon blow flies would be 48 hours later than the true time when death occurred. A case from western Montana demonstrates another example of how colonization of the blow flies can be delayed. The body of a middle aged male was discovered in an open field on August 21st. A contact gun shot wound with muzzle stamp was observed in the right temple area of the head with an exit wound seen behind the left ear. A 1991A Model Colt was seen lying on the ground beside the body. The body was removed to the Montana State Crime Lab where examination by the forensic pathologist suggested at least 24 to 48 hours postmortem due to drying of the tips of the ears and the fingers. Full rigor had been present when the remains were discovered, but rigor had passed by the 22nd when the autopsy was conducted. Investigation on the decedent's activities prior to death showed his last contact to be with the estranged wife. The wife received a phone call from the decedent at approximately 10 PM on August 19. There was a muffled noise in the background which could have been a gun shot. A cell phone was found in the pocket of the decedent. The forensic pathologist recognized the noticeable absence of fly eggs or larvae which should have been present with a body laying in an open, outdoor environment during summer for two days. Temperature data indicated daily highs for the two day period (August 20 and 21) when the blow flies should have colonized the remains were 74° and 76°F respectively. These daily highs are well above the 50°F lower limit threshold necessary for flight and egg laying activity. During body recovery, it was noted that there was a very high population of grasshoppers on the body. Artifacts of the skin were seen on the remains where it was suspected that insect feeding had taken place. These feeding areas were most likely the result of grasshoppers, due to the absence of other insect taxa (kinds). The absence of fly eggs and larvae were due, most likely, to the presence of high numbers of grasshoppers disturbing the female flies from depositing their eggs. This case is important in its documentation of high numbers of grasshoppers disturbing the blow flies from their normal egg deposition behavior and creating a delay of colonization for at least a two day interval if not longer. An explanation of a delay in colonization, as a result of high populations of grasshoppers, could have a major impact on the outcome of a death investigation.

Time of Death, Delayed Oviposition, Grasshopper

D55 A Proposed Taxonomy for Postmortem Genital Examinations With Colposcopy

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After attending this presentation, attendees will understand appropriate taxonomy that will allow us to better describe and document: the appearance of the anogenital tissues at various postmortem intervals; accurately and consistently describe anogenital tissue trauma; and more reliably compare rape-homicide trauma to the types of injury seen in living rape victims.

This presentation will impact the forensic community and/or humanity by demonstrating the development of appropriate taxonomy which will facilitate an ordered arrangement of terms, to more accurately describe the clinical findings of the postmortem genital examination. A methodical and systematic approach to documentation will hopefully: Improve the (diagnostic) acumen of the forensic examiner; provide a theoretical and practical framework for documentation of these examinations; avoid ambiguity in interpretation; and help promote consistency and reliability among examiners.

Finally, the development of appropriate taxonomy will facilitate closer cooperation between Sexual Assault Response Teams and other members of the forensic community. This will enhance both antemortem and postmortem criminal investigations, leading to improved services for victims and detection of offenders.

Baseline studies of genital anatomy and the nature of postmortem tissue changes are being conducted (Crowley & Peterson). These will allow eventual comparison to injuries noted in rape/homicide victims. A sequential methodology & evidentiary protocol has been previously described (AAFS/Crowley, 1998, 2003).

Fraser et al. (1999), modified a 1966 World Health Organization classification system, and cited "conditions or changes in the appearance" of the vagina and cervix after colposcopic examination of the vagina and cervix in healthy sexually active females. While it is helpful for the Forensic Examiner to be cognizant of classification systems used to describe findings in living subjects, taxonomy germane to the postmortem genital examination should incorporate salient terms, such as TEARS, that will be consistent and universally acceptable in the forensic community.

In a review of studies of injury patterns of women resulting from sexual assault, Sommers et al (2001) noted that "standardized classification systems to organize severity and location of injury need to be developed and tested."

Slaughter, Brown, Crowley, & Peck (1997), found that the typical pattern of injury and types of genital trauma in female rape victims consisted of tears, ecchymoses, abrasions, redness, and swelling (TEARS), all characteristic of blunt force trauma. When compared to a group of women that engaged in consensual sexual activity, there was considerable disparity in the frequency of genital trauma. As noted in this study, the development of taxonomy can help "establish a more reliable basis for forensic analysis."

During the assessment of the nature and pattern of wounds and injuries in living tissues, the astute examiner considers various gynecological conditions and factors that may influence the appearance of findings. Normal anatomical variations, nonspecific findings such as tags and adhesions, various gynecological conditions, and postmenopausal changes to the genital anatomy are part of the differential evaluation. Similarly, several factors are pivotal to a thorough postmortem genital examination. The same 11 anatomic structures in the female that are the most frequent sites of trauma in living rape victims must be equally scrutinized in postmortem cases.

These include the labia majora, labia minora, peri-urethral area, posterior fourchette, fossa navicularis, hymen, perineum, vagina, cervix, anus, and rectum. Death adds its own framework to the scenario. Factors such as lividity, rigor, postmortem interval, postmortem skin slip, mucosal autolysis, and normal postmortem dilatation (vs. antemortem prolapse of the vagina, urethra, cervix, and/or rectum) will affect the appearance of the tissues. When performing the autopsy, the Forensic Pathologist is well-familiar with these postmortem factors. However, the mucous membranes and skin of the genital area have traditionally received less specific scrutiny. Certainly the attention to detail of the anogenital sites have only recently been studied (Crowley/AAFS, 2000, 2001, 2002, 2003). The utilization of colposcopy further augments the precision of evaluation.

As these cases are examined and photographed, salient information must be collected and documented. As discussed in previous presentations, conventional terminology to describe genital trauma, i.e., sharp vs. blunt trauma, is recommended to provide consistency with the rest of the autopsy. Study of determinants such as multiple vs. single sites of injury, multiple types of injuries, and frequency of location may help us to better understand and classify the degree or severity of trauma.

The taxonomy will be further refined throughout the course of clinical evaluation of a normative, core group of baseline cases, representative of various causes of death, i.e., natural, accidental, suicide, and homicide (Crowley and Peterson).

Taxonomy, Postmortem Genital Examinations, Colposcopy D56 The Value of an Internship to a Forensic Science Education: A Student's Perspective

Jason M. Bomberger, BA, Pace University, One Pace Plaza, New York, NY 10038; Devon Pierce, BS, Pace University, One Pace Plaza, New York, NY 10038*

After attending this presentation, attendees will emphasize the importance internship participation in the training of future forensic scientists.

This presentation will impact the forensic community and/or humanity by demonstrating the argument to require the inclusion of internship as the best method for training well rounded forensic scientists.

The climate in the post September 11/CSI/OJ Simpson era has been one of unprecedented growth in the number of Forensic Science education programs around the country. The increased popularity of the field coupled with the need better trained forensic scientists in an increasingly technical environment (especially in DNA technology), have raised demand for educated forensic scientists to new heights. With the expansion in the number of programs, there has been like expansion in the number of approaches to training, with different programs emphasizing different requirements in line with what each deems important to turning out quality graduates.

One such variable requirement is the inclusion of an internship requirement into the curriculum of forensic science programs. Some schools include this prerequisite, others do not. One program that includes such a requirement is the Forensic Science Program at Pace University. Pace is a large university with campuses in New York City, White Plains, and Pleasantville, NY, with the forensic science program based out of the New York City campus. In order to receive a degree from Pace, students are required to perform an internship of four hundred hours duration, generally performed over the summer months. It is this obligation that the authors have recently completed.

Upon learning that it would be necessary to intern as part of the program, several obstacles were encountered. The largest of which, and the most difficult to overcome, was the availability of positions with the agencies performing the forensic analyses. No requirement exists for laboratories to accept interns and many do not. Other organizations do, but limit the numbers as a way to minimize resource and training

outlays. These factors, along with the increased numbers of students seeking positions, conspire to greatly increase the difficulty of even finding an internship in a given area. Combine this with the rising number of students seeking these openings and number of slots available dwindles quickly. Even if a placement were available, one must still tackle the problems of the requiring the student to effectively work full time for a summer for no pay, and the cost to the student for the credit-hours earned. All can be seen as potential detriments to a required internship.

Once the position was secured, and the formalities concluded, the perception of the internship requirement began to change dramatically. The learning experiences were three fold. Initially, there was the overview stage, where the student observed the overall workings of the laboratory, how evidence is handled, and how the laboratory tests are performed from the beginning of the process to the end. There was also the field stage, where the intern was afforded the opportunity to observe the work at scenes. There it was learned first hand the importance of the initial handling of the scene and evidence, and how all of the most sophisticated laboratory tests in the world cannot restore the probative value of evidence if the context and it's origin are lost. Finally, there came the contributory stage, where through one or more projects the intern was able to add to the knowledge base of the lab as well as demonstrating ability in a working setting.

While the primary focus of the internship experience is an educative one, other benefits soon noticed from the internships were of an interpersonal nature. It is often said that it is not what you know so much as who you know, and this is as true in the forensic science field as any. While interning, it was evident that it was important not only to learn as much as possible and to perform tasks to the best of ones ability, but to also meet people and develop relationships that will come into play when it comes time for collaboration or the all-important hiring.

From an examination of the author's experiences, it seems that both positive and negative experiences can be associated with the internship process. For the large part, the difficulties were found within the initial process of acquisition and organization, and not with the actual item itself. Once begun, the internship was revealed to be an invaluable learning experience, offering perspective on how this field works in the 'real world.' For no classroom setting, however intricately designed, can hope to substitute entirely for hands on experience in the work setting. Internships result in better-trained forensic scientists, and that ultimately is good not only for the students, but the entire field.

Forensic Science, Internship, Education

D57 Forensic Research and Training Opportunities IMSS: Institute for Medicolegal and Surgical Sciences at the University of California, Davis

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After attending this presentation, attendees will learn of a new facility available to support research and training in the forensic sciences.

This presentation will impact the forensic community and/or humanity by demonstrating there is a significant impact to the forensic science community regarding the availability of a new facility to support research, training and education in varied disciplines.

This session is intended to inform the forensic community about a new facility available for research and training opportunities at the University of California, Davis.

The IMSS facilitates forensic research and training at the University of California, Davis, by combining the services of the Department of Medicine's Donated Body Program and the Department of Wildlife, Fish, and Conservation Biology's Experimental Ecosystem. An outdoor facility is available at which research and training can take place that may or may not utilize human specimens. Additionally, laboratory and classroom facilities can be arranged as needed.

The IMSS strives to support multi-disciplinary research projects, as well as encourages the use of the facilities for death investigation workshops or other training programs with academic merit. The forensic community is invited to submit proposals for research and/or academic endeavors to be completed at the IMSS.

Forensic Science Research, Forensic Science Education, Forensic Science Training

D58 Survey of Physician Members of the American Academy of Forensic Sciences

B.G. Brogdon, MD, Department of Radiology, University of South Alabama Medical Center, 2451 Fillingham Street, Mobile, AL 36618*

After attending this presentation, attendees will understand the demography of physician members of AAFS, their workloads, satisfaction with the Academy and its Section and suggestions for improvements.

This presentation will impact the forensic community and/or humanity by providing demographic information hitherto unavailable concerning physician members of the Academy, their interests and activities in the forensic sciences, levels of satisfaction with their sections and programs, workloads, and suggestions for change.

In July 2003, there were 983 physician members of the American Academy of Forensic Sciences. Most are residents of the United States, but 130 physician members reside outside the U.S. on all six continents in 39 countries ranging from Azerbaidzhan to the United Arab Emirates. The largest number of them live in Canada, followed by France and Italy (tied for second) and Australia and Switzerland (tied for third). As one would expect, the largest number of non-U.S. physicians are found in Pathology/Biology, the largest section. But the largest percentage of non-U.S. physician members are in Criminalistics (7 of 9) and the General Section (16 of 34).

All but one of the ten sections of the Academy claim at least one physician member. The 101 physicians in Psychiatry and Behavioral Sciences must, by requirement, be psychiatrists or in residency training in that discipline. Of the 823 physician members in the Pathology/Biology section, the vast majority are specialists in pathology. But of the minority group in Path/Bio and of the physicians scattered in other sections (General, 34; Criminalistics, 9; Jurisprudence, 5; Toxicology, 4; Odontology, 3; Physical Anthropology, 3; Engineering, 1) little has been known. To partially remedy this situation a questionnaire was developed and, with the generous cooperation of Headquarters staff, circulated to every physician member and then re-circulated five weeks later. A 33.4% response was achieved. Response rate by section was: Path/Bio, 35%; Psych/Behav, 33%; General, 44%; Phys Anthropol, 67%; Jurisprudence, 40%; and Odontology, 33%. Unfortunately physician members of Criminalistics, Engineering and Toxicology did not return the questionnaire.

The majority of AAFS physicians identify themselves as pathologists and psychiatrists, of whom 80% and 89%, respectively, claim board certification. Nineteen of the 285 respondents from Path/Bio are not identified as pathologists; this is 6.7% of the total Path/Bio membership. Thus, by extrapolation, it might be expected that there are 55 non-pathologist physicians in that section which if added to other section memberships suggests that there are approximately 114 physician members of the Academy (12%) who are neither pathologists nor psychiatrists.

Non-pathologist, non-psychiatrist respondents listed a wide range of “major medical interest, practice or specialty.” Board certification in some specialty was claimed by 64% of them.

“Major fields of activity, interest, or occupation in the Forensic Sciences” were identified as medical examiner, 41%; coroner, 9%; pathology (non-M.E., non-coroner), 29%; psychiatry, 12%; and other, 7%.

Respondents from Pathology/Biology and Psychiatry and Behavioral Science apparently devote more full-time activity on a full-time basis than do members from other sections where part-time activities seem more prevalent. Three-fourths of the members in Path/Bio and Psychiatry, report a work week in excess of 40 hours. About half of the physicians in Path/Bio and Psychiatry report a work week in excess of 50 hours.

Whatever their section of membership, most physicians were satisfied with opportunities for participation and advancement, with scientific and educational content of AAFS programs, and with the collegiality and/or commonality of interest they found their section. Some criticisms and suggestions for improvement were offered.

Only a few respondents indicated dissatisfaction with their section membership or expressed a desire to transfer to a different section, a process for which there seems to be no constitutional provision at present.

There was scant support for formation of a new section comprised of physicians who are neither pathologist nor psychiatrist.

AAFS Membership, Physician’s Forensic Interests, Physician Specialists

D59 Employing a Hypothesis-Based Approach in the Processing of Forensic Biology Casework

Jack Laird, MSc, Johanne Almer, MSc, Roger Frappier, MSc, Andrew Greenfield, MSc, and Cecilia Hageman, PhD, Centre of Forensic Sciences, 25 Grosvenor Street, Toronto, ON M7A 2G8, Canada; Tony Tessarolo, BSc, Centre of Forensic Sciences, 70 Foster Drive, Suite 500, Sault Ste. Marie, ON P6A 6V3, Canada; Jonathan Newman, BSc, Centre of Forensic Sciences, 25 Grosvenor Street, Toronto, ON M7A 2G8, Canada*

After attending this presentation, attendees will learn about initiatives taken to process casework in an efficient manner by performing examinations and interpretations, and by writing reports such that they are all reflective of hypotheses formulated from the case history.

This presentation will impact the forensic community and/or humanity by hearing about how we are striving to process biology casework in relation to the hypothesis being tested, and by hearing of several examples of initiatives implemented in light of this strategy, we anticipate that other forensic labs will be interested in applying similar strategies so that the most relevant questions in a forensic examination are answered in the most efficient and timely manner possible. We also hope to stimulate discussion so that we have opportunities to learn from the experience of other labs.

Forensic scientists working in the adversarial justice system may at times be asked to carry out certain examinations, despite the fact that

inferences drawn from the results of such examinations do not adequately address the hypothesis being tested. In such instances, the limitations of a particular result outweigh its probative value without resolving the question at hand. Therefore, it is the responsibility of the scientist to make an evaluation of the potential inferences to be drawn prior to proceeding, so as to minimize the risk that any result generated may be misconstrued or abused in the judicial process. In his report detailing the proceedings of a judicial inquiry into the wrongful murder conviction of a man in Ontario in the mid-eighties, Mr. Justice Fred Kaufman eloquently expressed this principle, as it related to fibre examinations:

“A forensic scientist should approach the situation with an appropriate understanding and respect for the limitations of the fibre comparison process. The scientist should inform himself or herself of the relevant background facts or hypotheses, appreciating that they may later change or be the subject of contested evidence. If the fibre examination will clearly be worthless because it cannot permit any reliable inferences to be drawn, then it should not proceed. Only scientists - not investigators or counsel - can make that determination.” At the Centre of Forensic Sciences (CFS), we have strived to employ the same philosophy in all forensic disciplines.

Furthermore, the notion of hypothesis-based testing goes beyond a decision whether or not to examine any given item. The principle extends to all elements of the testing process, including the manner in which results are interpreted and reported to clients. This presentation will describe initiatives taken at the CFS, at every stage of our work, in order to ensure that the principle of hypothesis-based testing is maintained from the outset. Specific examples will be presented to demonstrate the approach at each stage of the process.

Collection of evidence at the scene of the crime

The CFS is not directly involved in the collection of evidence from crime scenes. However, scientists at the CFS designed, in partnership with other stakeholders, a new kit for the collection of biological evidence from victims of sexual assault (sexual assaults comprise roughly 60% of our caseload). Included in the kit are instructions for nurse-examiners to collect samples in accordance with specific allegations and limitations regarding the persistence of biological evidence.

Submission of evidence to the lab for analysis

- For most homicides, case conferences are held early in the investigation, at the instigation of the Office of the Chief Coroner, and involve representatives from the police along with scientists with the requisite expertise, and representatives from other agencies, as required. These discussions, which form part of an overall Major Case Management model in the province, serve to disseminate the circumstances of the case so that hypotheses can be formulated based on shared information. From the perspective of the CFS, these meetings serve to focus the scientific examinations that are required and to narrow the list of evidence items to be submitted to the lab. The meetings allow lab staff to make specific commitments to the investigators with respect to turnaround time (target is 30 days), which in turn allows them to plan the investigation more effectively.

- The CFS has recently expanded its services in the area of high-volume property crimes, but in anticipation of a potentially overwhelming response in terms of submissions, has strictly enforced criteria for police designed to identify a single sample from each case to be submitted, such that it has the highest likelihood of yielding a DNA profile as well as the highest likelihood of the profile being attributable to the perpetrator.

- A project to examine cold sexual assault cases was initiated with a major metropolitan police service. The program has demonstrated the benefits of working in partnership with our stakeholders in order to effectively and efficiently address the relevant hypotheses. A minimal number of key items were targeted for submission and examination in each case resulting in a high success rate.

Evaluation of the service request

Although not all cases are currently assessed by scientists prior to evidence submission, they are assessed prior to starting the examinations, and only those items which would effectively address the hypothesis at hand are targeted for analysis.

Screening evidence items for body fluids or other suitable sources of DNA

Elements of the case history impact upon the sequence with which items of evidence in a given case may be examined, as well as on the selection of appropriate samples for DNA analysis. Further information regarding how we have implemented strategies for case screening in the framework of a hypothesis-based approach, as well as examples, will be outlined in a supporting poster presentation.

Interpreting and reporting results of DNA analyses

Examples of how the interpretation and reporting of DNA results proceeds in the context of the specific hypothesis being tested will be discussed briefly with reference to the following key points:

- Appreciation for the fundamental technical limitations
 - amount of template DNA
 - indications of degradation/stochastic influences
- Assumptions
- Mixtures of DNA- incidental findings and forensic significance
 - DNA profiles from intimate samples
 - factors in an evaluation as to the suitability of a DNA profile for comparison

Further information regarding how we have implemented guidelines for the interpretation and reporting of DNA results in the framework of a hypothesis-based approach, as well as examples, will be outlined in a supporting poster presentation.

The forensic scientist is the person best equipped with the requisite knowledge, training, and experience to make decisions regarding the analysis of evidence, in partnership with stakeholders whom we rely on to provide the case history, with the understanding that alternate hypotheses may be presented at a future date. Applying the principles of hypothesis-based testing at each stage of the process, while respecting the limitations of any inferences to be drawn, ensures not only that the key objectives of a forensic examination are met but also that they are met in the most efficient manner possible.

Forensic Biology, Hypothesis Testing, Efficiency

D60 Forensic Science in a Postwar Context

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The goal of this presentation is to present to the forensic community the experience of forensic anthropologists in Guatemala, and the relation with the advancement and weaknesses of the forensic field in a post war context.

This presentation will impact the forensic community and/or humanity by discussing important issues related to the importance of forensic science.

Guatemala, a small country in Central America, lived one of the longest civil wars in Latin America, which lasted from 1962 until December the 29th, 1996, when the guatemalan government and the guerrilla movement signed the Peace Accords.

A few years before that, and due to the pressure of human rights organisations, forensic anthropology started to occupy an important place in the investigation of the recent past and the clarification of some of the most horrendous crimes that were committed during that dark period of guatemalan history.

During this period, there has been a significant advance in the quality of the work that is carried out, including, among other achievements the realisation of a big amount of forensic anthropology investigations, most of them related to the last two decades. Some of these correspond to mass graves, some of them are individual burials or hidden cemeteries. The guatemalan teams (three) have worked very hard to respond to the increasing demands of exhumations throughout the country. It has also improved the working systems at their laboratories, to make sure that the reports are submitted at the shorter term possible.

Some teams are looking forward to work not only in the forensic anthropology field but to contribute in the development of professional criminal investigation (and thus contribute in the creation of laboratories throughout the country), and to develop other sciences that could allow the creation of a solid base for the advancement of criminal investigations.

There is also the interest in making a continuing effort to build a strong relation with similar organisations, that are interested in the development of forensic sciences in the country, and with the strengthening of the national legal system.

Investigation processes about the legal system, would allow to find the problems that have to be addressed urgently. As a part these effort organisations such as the Centro de Analisis Forense y Ciencias Aplicadas CAFCA (Forensic Anthropology and Applied Sciences Centre) are also working on internal and external education processes on issues that include forensic anthropology, legal aspects of exhumations, national legal system, human rights, national recent history, among others.

There is a strong need to encourage the advance of forensic sciences in the country, by including forensic studies on a graduate and postgraduate level and also by the interaction with the national legal system.

The legal system's attitude towards the investigation of crimes needs to change. The treatment given to crime scenes in the country reflects that justice and truth are in many occasions, not the main interest. Even though serious crimes have occurred, the capacity of the national system, and the attitude towards discovering the truth through the serious treatment of evidence reflects the voids that need to be filled and the non professional attitudes that need to be corrected.

Guatemala, Forensic Sciences, Postwar Context

D61 Epidemiology and Evaluations of Findings in the Alleged Rape Victims

Purna Chand Dikshit, MD, LLB, Mukta Rani, MD, and Avneesh Gupta, MD, Department of Forensic Medicine, Maulana Azad Medical College, Delhi 110002, India*

After attending this presentation, attendees will learn about the profile of sexual assault in developing nation.

This presentation will impact the forensic community and/or humanity by demonstrating a better understanding of crimes in developing countries like India.

The study was conducted between the year 1996 and 2001 in the Department of Forensic Medicine, MAMC and associated L.N. and G.B. Pant Hospitals. The 601 cases of alleged rape victims were analyzed along with the haemotoxylin and eosin stained smear preparations which were examined for the presence of spermatozoa and parameters were discerned which would prove useful in establishing the offence of rape. It was found that the commonest age group of victims was 11-20 years (51.58%). A total of 323 (53.80%) victims were unmarried and only fourteen (2.4%) victims were pregnant. Most of the victims (93.8%) belonged to the poor socio-economic strata. In 22 cases (3.7%), some intoxicating substance was used to lower the victim's opposition. A

diurnal and seasonal variation was also found. Struggle marks in the form of injuries were seen only in 26 victims (5.4%). Fresh hymenal tear was present in 15.1% cases. A total of 178 cases (29.62%) showed sperms in the vaginal smear and sperm heads could be recovered from vagina as long as 7 days after coitus.

Rape Victims, Physical Injuries, Sexual Assault

D62 Facial Comparison of Persons Using Pictures

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This paper describes a standardized procedure to perform facial comparisons, in order to make the process of performing facial comparison as objective and consistent as possible.

This presentation will impact the forensic community and/or humanity by presenting a method for visual comparison and some preliminary results without matching methods like 3-point techniques or 3D laser scanning.

In all current, and probably most future applications for facial recognition, the final confirmatory check of the identity of a person with a travel document is done by visual matching. Especially in criminal cases, where the available evidence mostly is limited, but the correct identification of the criminal is crucial, the final decision will also be made by means of a visual check. However, this process is still subjective, and clear guidelines on how to perform such a comparison are hard to find. Therefore, we developed a procedure to standardize facial comparisons as much as possible.

Preferably, a comparison will take place with pictures taken from the same camera position, and from the same distance. If these are available, one-to-one metric comparison is possible. If a person and original camera equipment are available for comparison pictures, we use a three-point matching method to position the person according to the available pictures, and a direct comparison can be made. If the original equipment is not available, or the position of the person is hard to estimate, a 3D laser scanner could be used to take comparison pictures, followed by calculation of the most likely camera position and properties. However, in a lot of criminal cases, no additional comparison pictures can be made (e.g., when a crime suspect is still at large), and comparisons have to be performed using pictures from different time periods, camera positions and camera distances.

The method we developed comprises description of general information concerning the material, and scoring of general facial features (contours, relative measures, and positions), specific features (eyes, nose, ears, mouth, neck and throat), facial lines, folds and wrinkles, and typical like scars, moles, tattoos and piercings. Facial anthropological features are visually compared and classified as:

- SD. Similar into Details. Imaging conditions for this feature have been so good that it is to be expected that all details are visible.
- S. Similar. Imaging conditions are not optimal, in a sense that differences might be invisible.
- NO. No Observation. Observation is not possible due to circumstances.
- D. Different. Observed differences may be explained by differences in the imaging conditions.
- DD. Different into Details. Observed differences can only be explained by assuming that the features are physically different.

Features that cannot be compared due to large differences in age, facial expressions, or pose are classified as "NO."

Apparent similarities and differences are further evaluated by classifying features as:

- SD Strongly discriminating (e.g., the shape and position of a scar, a mole or a pattern of moles).

- MD. Moderately discriminating (e.g., a detailed shape of mouth and lips).
- WD. Weakly discriminating (e.g., the shape of the skull or the nose).

Conclusions from facial comparison are reported as level of support to the hypothesis that the persons depicted in the reference and disputed images are the same and/or as level of support to the hypothesis that these persons are different. The following levels of support can be given: 'very strong support,' 'strong support,' 'moderate support,' 'limited support,' 'no support.' In cases with similar support to both hypotheses, no conclusion can be drawn due to discrepancies.

Note that conclusions are not given in terms of probability, since to our knowledge insufficient quantitative data are available on the distribution of facial features in human populations. The estimation of the discriminating power of features and combinations of features is based on practical experience with facial comparisons.

It is our experience that using the above method, with a systematic list of features to be checked, forces the investigator to consider similarities and differences in a relatively objective way. The set-up of the systematic list will be used as a starting point of a system using statistical data on frequency of specific features, offering the opportunity to make the process even more objective.

Identification, Facial Comparison, Objectivity

D63 Criminal Misuse of Peroxide Explosives — Case Study From the United Kingdom

Claire McGavigan, MSc, Forensic Explosives Laboratory, Defence Science and Technology Laboratory, Building S12, Fort Halstead, Sevenoaks, Kent TN14 7BP, England, United Kingdom*

After attending this presentation, attendees will understand the experiences of peroxide explosives cases in the United Kingdom.

This presentation will impact the forensic community and/or humanity by demonstrating to laboratories who deal with explosives an appreciation of sharing the experiences of peroxide explosives cases in the UK, especially the development of a method for detecting trace levels of HMTD/TATP and presenting this evidence in court.

This presentation will concentrate on the work of the Forensic Explosives Laboratory (FEL) on one peroxide explosives case from the year 2000. Peroxide explosives are very sensitive primary high explosives that can be detonated by, for example, flame, impact and friction. The two organic peroxides most commonly encountered at the FEL are TATP (triacetone triperoxide) and HMTD (hexamethylene triperoxide diamine). The first encounter of the criminal misuse of such explosives in the UK is believed to have been in 1994 when an explosion occurred in a motor vehicle in a Jewish community. It is suspected that TATP was used as the initiator for the main charge in this explosives device, when as part of the police investigation approximately 1kg of TATP was recovered from a self-storage unit in London. Since then the FEL has dealt with a number of cases involving the criminal misuse of TATP and HMTD, in one such case the suspect had died while preparing HMTD.

The case to be presented started in November 2000 when a large quantity of sodium chlorate weedkiller, hexamine fuel tablets, citric acid and hydrogen peroxide were discovered in a small business unit by police in Birmingham, England following a large surveillance operation. These chemicals include the ingredients for the manufacture of HMTD (hexamine, acid and hydrogen peroxide). Subsequently a number of other properties in the same area were searched, with one property in particular revealing a large quantity of chemicals including HMTD powder and five improvised detonators containing HMTD. The following aspects of this case will be discussed:

- The role of FEL scientists at the crime scenes and their liaison with EOD (Explosive Ordnance Disposal) personnel and police exhibits officers.

- Significant items submitted to the laboratory.
- Procedures for examination and analysis of items. Including the need to develop a new method for the detection of trace levels of HMTD, not previously carried out at the FEL. This was achieved using the technique of LC/MS.
- Presenting the evidence from the FEL at the trial of two defendants at Birmingham Crown Court.

The results of the chemical analysis confirmed that HMTD had been found in one of the properties searched, including in the improvised detonators. A quantity of lead azide (another sensitive primary explosive) and small quantities of mixtures containing sulphur and sodium chlorate weedkiller were also identified in the items submitted. Sulphur/chlorate mixtures are extremely hazardous improvised pyrotechnic compositions due to their potential to spontaneously ignite. Trace levels of HMTD were also identified in samples from various items, for example, items of clothing.

It was concluded that the items submitted to the laboratory, including HMTD, lead azide, sulphur/chlorate mixtures and improvised detonators, indicated a serious and successful attempt to produce a wide range of explosive materials, which each posed a significant risk to public safety. They also had the potential to cause serious injury and possibly death and/or serious damage to property if directed against specific targets. The items submitted also included the chemicals to manufacture TATP (hydrogen peroxide, acetone and acid). However, no TATP or any reference to it was identified in the items examined.

Peroxide Explosives, Detection of Trace Levels, Presenting Evidence in Court

D64 The Jesse James Enigma - An On-Going Investigation on the Alleged Death of Jesse James in 1882

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The goal of this presentation is to reinforce the importance of checking the facts for one's self. There is no substitute for an actual review of the original source data. This is the case in the matter of historical and contemporary data surrounding the investigation of the death of Jesse James. Though sometime hard to find due to the fact that archives are "sanitized" or records are mislabeled. It is imperative to keep searching and checking the not so obvious. Check the facts for yourself, you may find an entirely different point of view.

This presentation will impact the forensic community and/or humanity by demonstrating that in spite of the credential of the parties involved in the 1995 study and rigors of scientific testing employed, nothing can replace objectivity in data analysis. There is a fine line between scientific review of the facts and shaping the evidence to meet a predetermined outcome. The Starrs report did not prove its stated outcome, yet everyone quotes the 99.7% certainly that it did. One would have to call that something other than science.

In 1995, the grave of Jesse W. James was exhumed in Kearney, Missouri, to refute claims that he staged his own death in 1882. DNA analysis was presented at the AAFS Annual Meeting in 1996, claiming the test proved that the exhumed remains were those of Jesse James to a 99.7% certainty. The forensic evidence and the "DNA Report" submitted to AAFS in 2000, do not support that claim.

A family in southeast Kansas claimed their ancestor, Jeremiah M. James was in fact the Missouri outlaw, Jeremiah "Jesse" Woodson James. After reviewing their evidence and investigating whether the 1995 study left any room for doubt it was to determine to proceed with a new study. After contacting the History Channel and Producer, Bill Kurtis, it was agreed that the evidence merited a second look. This led to a one-hour documentary featuring the exhumation of the grave of Jeremiah James in Kansas in May 2003.

A compilation of evidence in the form of historic photographic

comparisons, handwriting samples, exhumation, forensic anthropological examination and DNA testing of the physical remains will be presented. The study was conducted with the assistance of Dr. Peer Moore-Jansen, PhD, Director of the Anthropology Department at Wichita State University.

Jesse James, 2003 DNA Study-Neodesha, Kansas Exhumation

D1 The Los Angeles County Department of Coroner Special Operations Response Team: Case Examples of the Utility of Such Teams in Large Jurisdictions

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Attendees will learn through case examples the structure and utility of special operations and recovery teams for coroner/medical examiner offices in cases needing special handling or traditionally needing assistance from outside agencies, including mass fatality incidents (>5 decedents), multiple decedent assistance, special decedent recovery, buried bodies, decedent searches, and public relations events.

The Los Angeles County Department of Medical Examiner/Coroner (LACDOC) is one of the busiest offices in the U.S. In 2000, the LACDOC certified 9,156 cases: 2,668 accidental deaths, 21 fetal deaths, 1,070 homicides, 4,068 natural deaths, 728 suicides, 258 undetermined deaths, and 343 "other" (the latter category includes specimens and other remains not of forensic value).

It is estimated that approximately 75 of these cases involved multiple decedents, mass fatality incidents, special decedent recovery, and buried body recovery. Because of the difficulty in processing such scenes, the need for specialized training was recognized, and in 2001 the Special Operations and Recovery Team (SORT) was created.

Specially selected and trained coroner investigators, criminalists, forensic technicians and attendants, and other experts, including an anthropologist and an archaeologist, staff the SORT.

SORT is designed to provide field assistance to coroner investigators in cases needing special handling, or traditionally needing assistance from outside agencies. The general case categories to which SORT is designed to respond are: 1) mass fatality incidents, with five or more decedents; 2) multiple decedent assistance, at the discretion of relevant personnel; 3) special decedent recovery, including decedents found in remote areas or areas with difficult or restricted accessibility; 4) buried bodies; 5) decedent searches, including scattered skeletal remains and clandestine graves; and 6) public relations events.

The LACDOC is, to the knowledge of the authors, the only county agency in the country to initiate such a team. The reasons for this are likely many, but prominent among them is the large number of "special" cases seen in Los Angeles County. Through the use of case examples this paper presents the utility of teams such as SORT from the perspectives of the coroner investigator, criminalist, forensic pathologist, anthropologist, archaeologist, and outside law enforcement agencies.

The first case study involves the mid-air collision of two small aircraft over water. This was the first activation of the SORT, and as such was a learning experience. In this case, SORT was able to assist in the recovery of two decedents under very difficult circumstances.

Case example two involves deployment of SORT on a decedent search in a mountain environment. Prior to deployment, fragmentary skeletal remains from two individuals were recovered from a single

campground on two separate occasions. The area was considered a body dump, and a search was organized for the remainder of the two partially recovered decedents. Although no human remains were found, the search provided an invaluable avenue for personnel training and interagency cooperation.

The third case example involves an urban scene where construction workers unearthed human remains. An almost complete skeleton, including most of the feet and hands but excluding the cranium or mandible, were recovered over the course of three days under challenging conditions.

A fourth example involves a fire scene. In a high-profile incident, a suspect barricaded himself in his home. The house burned to the ground. SORT recovered several burned tooth fragments, along with cranial fragments, long bone fragments, and personal possessions of the decedent. The tooth fragments were useful in positive identification of the decedent.

The case studies illustrate well the value of a team such as SORT in large jurisdictions. Personnel, both within LACDOC and in outside agencies which interact with LACDOC, agree that having a team that trains together for difficult special recoveries, the members of which work well together, makes any recovery, no matter how difficult, run more smoothly. The SORT also increases the likelihood of complete recovery of relevant remains and the rate of positive identification of unknown decedents in Los Angeles County.

Special Decedent Recovery, Coroner Special Operations, Buried Body Recovery

D2 The Living Quality Manual: An Essential For Every Forensic Laboratory

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The goal of this presentation is to describe one laboratory's approach to the development of a quality manual that incorporates all essential accreditation requirements and still has room for future growth.

The focus of today's business environment is towards one of increasing quality, certification, and accreditation. The forensic community has also felt the impact of this trend, mainly through the changing and growing requirements put forth by ASCLD-LAB as it looks to adopt recommendations from ISO (International Organization for Standardization) and various scientific and technical working groups. The problem many laboratories face today is how to incorporate requirements and recommendations from so many different sources in order to maintain necessary accreditations. Laboratories have had policies and procedures for many years, but often those manuals were written in such a way as to make adaptation to today's standards nearly impossible. How to write a quality manual that can change with the times is not an insignificant task.

Ideas for how to structure the new quality manual were researched. The quality manuals from other forensic laboratories and the quality systems implemented by non-forensic ISO certified organizations were reviewed. The system ultimately devised was structured by sectioning off all the different areas of laboratory operations into a table of contents. This consisted of the following nineteen areas:

1. Introduction
2. Personnel
3. Physical Plant
4. Document and Information Management

5. Safety
6. Customer Service
7. Subpoenas and Court
8. Purchasing
9. Laboratory Audits and Inspections
10. Chemicals, Standards, and Reagents
11. Evidence Control
12. Processing and Analyzing Controlled Substances
13. Processing and Analyzing Suspected Ignitable Liquid Submissions
14. Processing and Analyzing "Other" Evidence
15. Instruments and Equipment
16. Validation and Verification of Analytical Methods
17. Proficiency and Competency Testing
18. Corrective and Preventive Action
19. Other Professional Services.

Each section was further subdivided as necessary. The subsections were numbered at increments of five or ten to allow room for additions and changes. The development of each subsection was assigned to different personnel under the direction of the laboratory director. Each subsection contained only one policy supported by multiple methods, forms, documents, and logbooks as appropriate. A unique identifier was given to each document created. This identifier included the subsection number and a letter designation of "P" for policy, "M" for method, "F" for form, "L" for logbook, and "D" for document.

A standard layout was established under which each policy and method was created. Every policy and method had the same header of the laboratory name, section number and title. The information that appeared next was whether it was a policy or method followed by the subsection title. For example: 1535P Equipment Maintenance. Lines indicating revision, effective date, affected personnel, and approval signatures appeared next on each policy or method. The body of each policy and method included: scope, references, definitions, policy, or method as appropriate, and records. References included any other related sections of the quality manual, internally created documents, and external literature references. Definitions were created for consistency and clarity and were compiled into a glossary created for the quality manual. Records included any related forms or logbooks that were created during execution of the policy or method. Lastly, each policy had an area that was titled "compliance." Here the laboratory tracked the ASCLD-LAB, SWG, and TWG sections covered by the policy.

Analytical methods were structured a little differently to include additional sections titled "validation and verification" and "reagents and chemicals." The validation and verification section listed references for the method as well as in-house testing that was done to further validate or verify the use of the method. In-house testing documentation required for the quality manual is specified in the quality manual under a section titled "validation and verification." This format allowed a tie between the investigation and implementation phases of a method.

One of the biggest challenges a laboratory faces Under ISO is document control. This challenge is largely overcome by electronic maintenance of the quality manual. The electronic version is cross-referenced by hyperlinks to make it very user friendly. Only one hard copy of the quality manual exists in the laboratory and is maintained by the quality manager. This is the controlled copy of the quality manual. Laboratory personnel affected by a policy or method are required to sign each document signifying they were trained and cognizant of the method or policy content. As new revisions go into effect, they are presented at the monthly staff meeting and affected personnel are required to sign the new revision. All personnel have access to the quality manual electronically and sections of the quality manual may be printed. It is the users responsibility to ensure that they are not referring to outdated versions. A spreadsheet is maintained to track the implementation dates and revisions while old revisions are archived. Another spreadsheet is maintained to track on-going work to the quality manual including

personnel responsibilities and target deadlines.

While starting a new quality manual from scratch can be an overwhelming task, structuring the documentation system in such a manageable format is well worth the time. By gaining input from as many people as possible the task not only becomes easier, but even more important, buy-in to the new system is achieved. Adding pieces to older documentation to meet the new accreditation requirements only results in an awkward and difficult to use quality manual. A new quality manual that is electronically based will allow for easy, unlimited future growth.

Quality Assurance, Accreditation, Quality Manual

D3 An Analysis of the Suspiciousness Factor and Role Opportunity as Related to Forensic Evidence Capture in Hospital Emergency Departments

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The goals of this poster presentation are to demonstrate the effectiveness of the clinical forensic nurse in case-finding and evidence management within the hospital emergency department. A series of patient cases will be used to illustrate the benefits of having clinical forensic nurse presence during the initial contact with a patient at healthcare's point of entry. In each of these cases, the evidence identified, documented, and preserved by the nurse later became a vital element in medical-legal or criminal proceedings.

There is a significant amount of vital forensic evidence that is unrecognized, compromised, or even irretrievably lost during resuscitation and other emergency care regimens. Failure to recognize and safeguard evidence in healthcare settings may result in medical errors, miscarriages of justice for victims or perpetrators, and may result in lengthy, complex investigations. Healthcare dollars and manpower resources consumed to support these endeavors may derail other mission activities and create immeasurable human burdens. In high-profile cases, healthcare workers, the administration of the medical treatment facility, and the federal government necessarily assume some part of the embarrassment, culpability, and tainted image that accompany public disclosure of adverse patient events and evidence mismanagement.

The emergency department is the point of entry for most patients who are victims of accidents or who become acutely ill. Patients arrive by ambulance or private transportation. In some locations, patients walk in alone, suffering from life-threatening illness or injury. Since nurses triage and obtain the data for the baseline history and physical assessment, they have the rare opportunity to capture information that may subsequently be altered or destroyed during the course of further examinations, diagnostic tests, and medical treatments. A well-honed forensic *suspiciousness factor*, coupled with human experiences and clinical judgment, provides an ideal acumen in the Emergency Department. Careful recording of anecdotal details of how an injury occurred, a thorough body survey, and precise observations about the patient's behavior may reveal important clues that may ultimately prove to be the linchpin for solving a forensic case. A forensic clinical nurse's education, skill training, and indoctrination help to facilitate the identification, preservation, and safeguarding of evidentiary materials. This acumen is "value added" to the typical emergency nurse's role. The hospital's quality management programs, as well as healthcare beneficiaries and justice systems, individually and collectively, derive benefit from the forensic competencies of nursing personnel.

Patients presented to the hospital's emergency department do not wear a tag, **Caution Forensic Case in Process**. However, the clinical forensic nurse believes that any patient encounter may already possess, or could develop, forensic implications. Vigilance and consistency in

assessment and documentation are hallmarks of a clinical forensic nurse. The refusal to “take stories at face value,” the belief that every detail in the history and physical examination has significance, and that all patients deserve to have their human rights protected during the course of medical care are major tenets of a forensic nurse.

Forensic science indoctrination is no longer an option in healthcare facilities. The standards and scoring guidelines of the Joint Commission for Accreditation of Healthcare Organizations mandate that hospitals must equip all personnel to identify abuse and neglect, to take certain steps to protect the victims, and to refer them to appropriate resources for follow-up. This provides the foundation for a healthcare facility to justify the presence of the clinical forensic nurse, especially at entry points where many individuals may present for care. Hospital resources must be committed to forensic initiatives, even in times of overwhelming workloads, short staffing, and personnel shortfalls. The penalty for missing forensic clues and failing to initiate appropriate interventions may cost the patient his life and place a nurse’s professional career in jeopardy. The costs for damage control when nurses fail beneficiaries and violate the public trust cannot be measured. Forensic education and training should be encouraged and emphasized at all levels within the hospital’s chain-of-command, and position descriptions should be updated, listing specific forensic roles and responsibilities for the clinicians, supervisors, and administrators. The placement of a qualified forensic nurse in the emergency department is relevant and reasonable and demonstrates to patients the highest standards of patient care delivery.

Evidence, Forensic Nursing, Suspiciousness Factor

D4 Latent Fingerprint Detection on Dry Human Bones Using Ninhydrin, Cyanoacrylate-Fuming, and Rhodamine-6-G Methods

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The goal of this presentation is to determine the visibility of latent fingerprints on dry human bones with the intent of aiding law enforcement officials in determining culpability of homicide.

Previous studies have determined that Ninhydrin is an effective reagent in visualizing fingerprints on porous surfaces such as paper, cardboard, raw wood, and wall coverings. The Cyanoacrylate-Fuming method uses Cyanoacrylate fumes combined with humidity to develop latent fingerprints on non-porous surfaces and some porous surfaces. Both the Ninhydrin and the Cyanoacrylate-Fuming (Superglue™) techniques were used to determine which, if not both, were the most effective in visualizing latent fingerprints.

This study incorporated human femora, human pelvic bones, and deer femora from the FACES Laboratory at Louisiana State University. Cases from as early as 1983, and as recently as 2001, were used to differentiate time parameters in determining the length of time fingerprints persist on porous surfaces. Cleaned, processed bones were used as well as bones that had been housed immediately following recovery. These variables were used in order to determine the conditions necessary to reach the optimum visibility on these bones.

Ninhydrin involves a chemical reaction using a Ninhydrin crystal-

based reagent to stain a porous surface when reacting with amino acids in the fingerprint. The resulting stain is called “Ruhemann’s Purple” after the English chemist that first developed Ninhydrin in the early 1900s. The solution can be applied by painting, dipping, pouring, or spraying and is reapplied in the same manner twenty-four hours later. Heat and humidity are then applied to accelerate the development of prints. It is necessary to monitor the progress of the fingerprints as the process advances in order to record any visible prints that may appear and then disappear quickly.

The Cyanoacrylate-Fuming method produces more rapid results using an environmental Cyanoacrylate-fuming chamber. This allows the researcher to control the amount of humidity that is necessary for the adherence of fumes to the fingerprints. The Cyanoacrylate ester (Superglue™) packet is opened and sealed in the chamber with the bones and open containers of steaming water. This humidity facilitates development of latent prints that are present. The fumes produce a white deposit that adheres to the protein compounds in the fingerprints. The bones are then processed with Rhodamine-6-G, which is a fluorescent dye that is used to stain the fingerprints. When using these methods, it is important to perform either the Ninhydrin test or the Cyanoacrylate-Fuming method, since these methods do interfere with one another.

Initial testing showed that the deer femur developed latent fingerprints within thirty minutes using the Ninhydrin method but the prints disappeared within two hours. The Cyanoacrylate-Fuming method did not produce any results on the deer femur.

The human bones did not produce any visible fingerprints using the Cyanoacrylate-Fuming method initially. In order to determine the viability of the Ninhydrin test, lotion, which reacts with Ninhydrin, was applied to the hands of the researcher before the bones were handled again and the Ninhydrin was re-applied. The human bones produced visible prints using the Ninhydrin method after applying lotion to the hands.

Further testing showed that the human bones developed latent prints using the Cyanoacrylate-Fuming method with recent handling of these bones, but the prints only showed up after they were treated with Rhodamine-6-G. Fingerprints were not developed on the human bones with the Ninhydrin method; however, the deer femur did develop latent fingerprints using the Ninhydrin method, and the prints showed up within one hour of applying the solution. The prints did not absorb into the background after two hours as in the original test. However, the deer femur only produced results with the Ninhydrin and not the Cyanoacrylate-Fuming method.

Both the Ninhydrin and Cyanoacrylate-Fuming methods have been tested on human and deer bone in an attempt to show the presence of latent fingerprints. The Ninhydrin test proved to be most effective on the deer femora and the Cyanoacrylate-Fuming method proved to be the most effective on the human bone after treating with Rhodamine-6-G.

The delineation between the processes and their effectiveness could be due to the differences in osteon alignment in human and non-human bone or the compactness therein. Studies in osteon alignment in human and non-human bone have suggested that the non-human bones have more of a regulated alignment than do human bones. This could affect the porosity of the bone and allow fingerprints to be absorbed into bone at a more rapid pace in human bone than in non-human. The Ninhydrin method might have better results with the non-human bones, due to the compactness of the cortical bone versus the porosity of human bone. The Cyanoacrylate-Fuming method might work better on more porous surfaces such as human bone.

To be able to visualize latent fingerprints on human and non-human bone may not only impact homicide cases but may also be an effective tool in Wildlife and Fisheries departments across the country. The research shows that latent fingerprints can be visible on dry human bones as well as non-human bones. The next step in this research is to determine how long the fingerprints will remain on bone in various climates.

Fingerprints, Ninhydrin, Cyanoacrylate-Fuming

D5 Experimental .38 Caliber Pellet for Use in Environments Requiring Limited Penetration

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The goals of this presentation are to understand (1) the design and fabrication of an experimental .38 caliber pellet for use by law enforcement officers, (2) the combination of mass and velocity needed to produce enough energy for the experimental pellet to perforate skin, and (3) the depth of penetration in a pine board for the experimental pellets.

The purpose of this presentation is to offer the results of a study that evaluates an experimental subsonic .38 caliber non-diabolo styled pointed lead alloy pellet for use in environments that require limited penetration for projectiles. Aircraft passenger compartments and cockpit areas may be suitable for this type of ammunition in anti-terrorist situations. The risk of rupturing an aircraft fuselage would be less probable with the experimental .38 caliber pellet because it would have considerably less energy than a standard .38 caliber bullet. The development of a large caliber pellet would give law enforcement officers some options when selecting ammunition for environments that require limited penetration.

An experimental .38 caliber pellet was designed and a limited number were produced for the test. A positive pellet mold was made by turning a piece of aluminum stock on a lathe .350 thousandths of an inch in diameter and .620 thousandths of an inch long with a 45-degree point. The positive pellet mold was placed in a soft pliable mixture of plaster of Paris and allowed to solidify. Once the plaster solidified the positive mold was removed to produce a negative mold of the pellet's form. When the plaster mold was completely dry, molten lead was poured in the negative impression to produce a .38 caliber lead pellet. The 45-degree nose point of the pellet was machined on the lathe and the base was drilled to produce the pellet. The base of the pellet was drilled to a .250 thousandths of an inch diameter and .300 thousandths of an inch deep to produce the cavity in the pellet. The length of the experimental pellet was .620 thousandths of an inch long and the outside diameter was .360 thousandths of an inch. The wall thickness at the base of the pellet is approximately .060 thousandths of an inch. The exterior surface of the pellet's tip was filed while in the lathe to produce a smooth finish.

A .357 Smith & Wesson model 686 with a four-inch barrel was used to test the experimental pellets. The pellets with an average mass of 5.302 grams were tested with five propellant charges to determine the average velocity of each propellant charge. The average velocity for pellets loaded with 0.5-grains of Hercules Unique powder was 45 m/s (149 ft/s); 1.0-grains was 213 m/s (697 ft/s); 1.5-grains was 263 m/s (865 ft/s); 2.0-grains was 273 m/s (897 ft/s); and, 3.0-grains was 379 m/s (1244 ft/s). The test determined that pellets loaded with less than 1.0-grains of propellant did not always have sufficient energy to exit the barrel of the weapon; this was possibly due to the amount of friction between the pellet and barrel. Pellets stuck in the barrel were removed with a bullet puller.

DiMaio, et al., have determined that the minimum velocity needed for a .38 caliber round nose lead bullet with a weight of 113-grains to perforate skin is 58 m/s (191 ft/s). The Formula, Kinetic Energy, $KE = \frac{1}{2} \cdot mv^2$, was used to convert the bullet mass and the minimum velocity to the amount of energy in joules needed to perforate the skin. The mass is expressed in kg and the velocity in m/s. The 113-grain bullet with a mass of 7.345 grams produces 12.5 joules (9.21 ft-lb) of energy. Therefore, the experimental pellets need to have at least this much energy or higher to perforate skin. Since the mass of the .38 caliber test pellets is less than 7.345 grams, they will need more velocity to obtain the minimum amount of energy to perforate skin.

Based on the KE needed to perforate skin, two propellant charges were selected for testing the experimental pellets. Four test pellets were loaded with 1.0-grains of Hercules Unique smokeless powder and four rounds were loaded with 1.5-grains of Hercules Unique smokeless powder. The range of mass for the test pellets loaded with one grain of powder was 5.302 grams to 5.436 grams with a mean mass of 5.370 grams. The average velocity for these pellets was 188 m/s (615 ft/s). The range of mass for test pellets loaded with 1.5-grains of powder was 5.388 to 5.670 grams with a mean mass of 5.480 grams. The average velocity was 273 m/s (897 ft/s). The pellets were fired at a distance of 7.62 m (25 ft) into a pine board 53.34 cm (1- $\frac{3}{4}$ in) thick. A chronograph was used to determine the velocity for each pellet and the depth of penetration was measured with the depth gauge on dial calipers.

The average KE for pellets loaded with 1.0-grains of propellant was 95 joules (70 ft-lb) and for pellets loaded with 1.5 grains of propellant, it was 205 joules (151 ft-lb). Even though 1.0-grains of propellant produce more than the minimum amount of energy required to perforate the skin, the load with 1.5-grains was determined to be more reliable during the testing. The ammunition containing 0.5-grains more propellant had more than twice the amount of energy needed to perforate skin, but performs more consistently in the weapon than the 1.0-grains load and has considerably less energy than a .38 caliber factory load. A .38 special factory load with a 158-grain lead round nose bullet with a mass of 10.24 grams produces 271 joules (200 ft-lb) of energy. This is 71 joules (52 ft-lb) more than the experimental pellet. The degree of penetration in the pine board was obtained by measuring from the surface of the wood to the base of the pellet. The range of depth for pellets having an average energy of 95 joules (70 ft-lb) was 8.25 mm (.325 in) to 12.22 mm (.481 in) with an average depth of 10.16 mm (.400 in). The range of depth for pellets having an average energy of 205 joules (151 ft-lb) was 18.21 mm (.717 in) to 25.27 mm (.995 in) with an average depth of 21.34 mm (.840 in). Reliable .38 caliber pellet ammunition delivering approximately 200 joules (148 ft-lb) of energy would give law enforcement officers an option when limited penetration is required.

Pellet, Firearms, Ammunition

D6 The Potential Value of Ejected Cartridge Casing Impact Marks in Shooting Scene Reconstruction

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The goals of this presentation are to raise awareness of the potential value of ejected ammunition cartridge marks at shooting scenes. This presentation proposes that scene investigators should consider the possible presence, and potential value, of ejected cartridge impact marks at shooting scenes.

According to the Federal Bureau of Investigation's 1999 Uniform Crime Report statistics, 65.2 percent of all murders committed in the U.S. involve the use of a firearm, and 78.6 percent of those were committed with a handgun. The study of matters related to firearms use during the commission of offenses is vitally important to the successful investigation and accurate reconstruction of these crimes.

Post-event reconstruction requires a thorough scene examination, comprehensive scene documentation, interviews of eyewitnesses, and the careful collection and examination of physical evidence. In cases where firearm discharges are involved, forensic examinations of weapons, projectiles, and ammunition casings are commonly conducted. In addition, trajectory assessments, range-of-fire determinations,

bloodstain patterns, and gunshot residue findings are oftentimes considered in reconstructing events.

Stemming from observations made at a police firing range, this study sought to determine if ejected cartridge casings leave characteristic marks when they impact nearby materials. This paper will present information and images pertaining to marks made when expended 9mm ammunition cartridges were ejected from a handgun. The dynamics and mechanical processes at work when an expended cartridge is ejected from a pistol will be reviewed. The results of test firings from a Sig-Sauer model P228, 9mm pistol, where ejected casings were allowed to impact 3/8-inch wallboard, will be summarized. Photographic images showing four characteristic impact marks will be presented.

In conclusion, hypothetical examples of how the presence of casing impact marks might be helpful in scene reconstruction will be presented and discussed.

Shooting Scene Reconstruction, Ammunition Cartridges, Impact Impressions

D7 A Report of the First AAFS Forensic Science Education Conference

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The goals of this presentation are to explain the Academy's new Forensic Science Education Conference project. Attendees will learn details of the Academy's initiative to provide forensic science knowledge to the nation's middle- and high school science and math teachers.

In July 2002, one hundred twenty middle- and high school teachers attended the First Forensic Science Education Conference in St. Louis. The conference acquainted the teachers with all the forensic sciences and the American Academy of Forensic Sciences.

In December 2000, the results of the Third International Mathematics and Science Survey (TIMSS) were released comparing U.S. students with those of 41 other nations. At the fourth grade level, U.S. students scored in the top quartile in both math and science. At the eighth grade level, U.S. students scored slightly above the international average in science and below the international average in mathematics. At the end of 12th grade, the performance U.S. students in both math and science ranked among the very lowest in math and science of the 42 countries, including the performance of the most advanced students. At the Council of Scientific Society Presidents meeting in December 2000, attendees agreed that few of today's U.S. middle- and high school students showed interest in the basic sciences, but the vast majority of middle and high school students were enthralled with the forensic sciences.

In February 2001, recognizing that the American Academy of Forensic Sciences was in a pivotal position to promote the forensic sciences to America's youth, discussions of a collaborative initiative between the AAFS and middle- and high school science and mathematic teachers was initiated by the AAFS. Volunteers were recruited via the *Academy News* from among the membership to assist teachers requesting technical assistance in introducing the forensic sciences to their students. At the 2002 AAFS annual meeting in Atlanta, Director of Development Jim Hurley met with interested members and began the formation of a mentoring network. The Trustees of the Forensic Science Foundation also gave their support to the concept and agreed to revise the Academy's "So You Want To Be A Forensic Scientist" booklet.

In March 2001, AAFS members were spotlighted in a workshop that was held at the National Science Teachers Association annual meeting in St. Louis. Approximately 100 science teachers attending the workshop showed very strong support for additional information regarding the forensic sciences. Virtually all in attendance said that they

would attend a summer conference in 2002 if AAFS members would provide them instruction as to how to incorporate forensic science applications into their classrooms.

In April 2001, an application was submitted to The Saigh Foundation to support a conference to inform middle- and high school science teachers of the disciplines that could be introduced into their science curricula. In October 2001, The Saigh Foundation did award a \$50,000 grant to the AAFS to conduct a three-day conference in July 2002, at Saint Louis University in St. Louis, MO.

The three-day conference was held July 25-27, 2002. More than 120 middle- and high school science teachers attended from 30 states and Poland. Fifteen AAFS members provided presentations and fourteen workshops were conducted to illustrate forensic science experiments that could be conducted in middle- and high school science laboratories. All sections of the AAFS were featured to ensure that teachers were aware of the variety of forensic specialists that compose the world of forensic science. A four hundred-page manual was developed and distributed to teachers that included a lesson plan for each discipline's workshop.

A description of the conference program and workshops will be presented. Results of conference registrants' evaluations will be provided. A template that has been developed to assist designers of future conferences will also be explained.

Education, Forensic Sciences, Conferences

D8 Forensic Use of Biometric Access Devices

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The goals of this presentation are to **increase** awareness of forensic evidence from biometric access devices and methods of tampering with these devices that have to be taken into account before drawing conclusions.

Over the past few years, both large multinationals and governments have begun to contribute to even larger projects on biometric devices. Recent terrorist attacks in America and in other countries have highlighted the need for better identification systems for people as well as improved systems for controlling access to buildings. Another reason for investment in Research and Development in Biometric Devices is the massive growth in internet-based systems – whether for e-commerce, e-government, or internal processes within organizations. The interface between the system and the user is routinely abused, as people have to remember many complex passwords and handle tokens of various types.

Many users fall prey to socially engineered attacks, or choose easy-to-guess passwords and then write them down. For the reason of security, biometric systems are used. Systems with fingerprints, iris, hand scans, and faces are commercially available and are also used at airports. Many other biometric data are under investigation for commercial systems, as ears, gait, keystroke, odor, etc.

Testing and comparison of biometric systems has been an issue. Comparison of algorithms used in facial recognition is undertaken in the FERET program. Often of more interest is the "real life" performance in a situation approximating that of future deployment. New suppliers are often tempted to make claims of excellent performance based upon a small laboratory test or mathematical simulations. In practice it appears that face systems are still not good enough for many applications, since faces change in time, and they are difficult to acquire in a standardized way. New developments are in heat maps and thermograms, and developers claim that easier identification of individuals is possible. The BIOTEST project led by the National Physics Laboratory has produced a set of best practice guidelines for these systems that can be used for examining biometric systems. Also NIST is involved in developing standards for biometric systems.

The literature in this field is mostly focused on a well-engineered sensor, or the algorithms that are used. Less well-described are the systems of which biometric is a small part. If it is not integrated securely, or if the system is vulnerable to an unexpected attack, even the best device will be compromised. Often the biometric system compromises a smart card with data of the finger print or the iris scan which is compared with the data of the person that would like to have access.

For forensic evidence the biometric devices can be important, since more information is available of the person who tries to access a building or a computer. They may also be helpful in cases of hacking if a suspect has been logged on with biometric data (e.g., a fingerprint).

With biometric devices it is still possible to have unauthorized access. Depending on the chip card that is used, someone can tamper with the data. Furthermore, it is also possible to copy the data from a person (e.g., a silicon cast of a finger). The problem with spoofed biometric data is that they cannot be revoked and renewed, as would have been done with a stolen key. Another reason for unauthorized access is that there are false acceptance rates, depending on the settings of the biometric device. Often the setting of the biometric device will be changed to have less false rejects, and this might cause the system to fail. In practice, biometrics is not more secure than PINs. For this reason it is good to have a combination of biometric data and PINs for access.

In forensic evidence with biometric devices the forensic examiner should consider the possibilities of tampering with the biometric systems or the possibilities of unauthorized access before drawing conclusions.

Biometrics, Tampering, Fingerprints

D9 Meta-Sadism vs. Clinical Sadism

Richard D. Walter, MA, 78 Church Street, Montrose, PA*

The goals of this presentation are to differentiate conceptual and practical uses of sadism in criminology and psychology.

This paper will examine the underlying issues at hand in an effort to make conceptual and pragmatic sense relative to “Sadism” and to offer an alternative to the misuse and torture of “Clinical Sadism” as understood in DSM-VI. Clinical Sadism, as a psychological/psychiatric concept, is a specialized body of knowledge that is relative to the diagnosis and treatment of the individual. Alternatively, when the issues are crime analysis, crime behavior, and probabilities for a crime typology, the focus should be appropriately changed to a criminological assessment and the psychologist/psychiatrist should utilize the concepts of deviancy. This continuum and these learning curves are called Meta-Sadism. Accordingly, when the continuums are appropriately referenced and differentiated, the clear separation allows for a dynamic understanding of sadism.

Sadism, Crime, Deviancy

D10 Characterization of Condom Lubricant Traces Using Raman Spectroscopy and Raman Chemical Imaging

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The goal of this presentation is to acquaint the forensic community in using Raman Spectroscopy and Raman Chemical Imaging for identifying condom trace evidence.

This presentation will address the use of Raman spectroscopy and Raman chemical imaging as primary methods in identifying condom lubricant traces such as polydimethylsiloxane (PDMS), polyethylene

glycol (PEG), nonoxynol-9 (N9), and fine particulates. Chemical imaging possesses the ability to identify these materials in the presence of one another, providing they possess unique Raman spectra, thus minimizing sample preparation that is needed with current methods, namely Fourier Transform-Infrared (FT-IR) analysis. The focus of this experiment lies in applying this methodology to real world samples and demonstrating the use of Raman analysis as a primary analytical technique.

Dispersive Raman spectroscopy in conjunction with wide field Raman Chemical Imaging was used to analyze all samples. PDMS, PEG, N9, and lycopodium spore standards were analyzed, as these are all common lubricant traces. Trojan ultra thin spermicidally lubricated (Carter Wallace, Inc., Carter Products Division) and Plus Beyond Seven SheerIon spermicidally lubricated (Okamoto Industries, Inc.) condoms were also analyzed. Small amounts of raw material from these condoms were examined, and extraction experiments were also carried out according to a protocol set up for FT-IR analysis.

Dispersive analysis of pure components revealed most were Raman accessible. Lycopodium was found to be extremely fluorescent; however, this feature can still be used to characterize it on a Raman system in imaging mode if surface morphology is also considered. All of the other standards exhibited unique Raman spectra, which indicates chemical imaging will be capable of identifying each component. Next efforts focused on differentiating spermicide and lubricant in the presence of one another, namely PDMS and N9, since these are known to be immiscible. Optically the mixture looked no different than the pure components, a transparent liquid, save a few structures that resembled bubbles. Chemical imaging revealed the bubbles were actually emulsions of PDMS in N9.

Analysis of raw material from the Beyond Seven condom optically looked very similar to the mixture of pure components. The lubricant was a transparent liquid with bubbles. In this case, chemical imaging showed the bubbles to be N9 emulsions in PDMS. This is a prime example of how multiple lubricant components can be identified with Raman chemical imaging without first having to extract the sample and isolate the materials.

Analysis of the raw material from the Trojan condom showed predominantly PDMS; however, some weak Raman bands can be seen that are consistent with N9. Dichloromethane and water extracts of the raw material were analyzed. Raman chemical imaging was able to identify PDMS and starch from a dichloromethane extraction. N9 was identified in a water extract as well as calcium carbonate.

This experiment indicates that some of the most common materials found in lubricants are very Raman accessible and can be accurately analyzed by Raman spectroscopy. Furthermore, the analysis can extend to Raman chemical imaging possibly eliminating superfluous sample preparation and multi-instrument analysis.

Condom Lubricants, Raman, Trace Evidence

D11 Bilateral Perforation of the Tympanic Membranes in a Tornado Victim: An Under-Reported Injury?

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The goal of this presentation is to present the audience with autopsy findings in a tornado victim, to increase the level of awareness of tornadoes and their potentials to cause injuries.

Perforation of the tympanic membrane is a predictable outcome of drastic shifts in atmospheric pressure, creating a differential between atmospheric pressure and air pressure of the middle ear chamber.

Tympanic perforation due to barotrauma is most commonly encountered in deep sea diving or exposure to bomb blasts. Lightning victims, exposed to rarified air and altered atmospheric pressure, have sustained injuries to the tympanic membrane. The enormous changes of atmospheric pressure in gale-force wind conditions such as tornadoes and hurricanes have not been reported to associate with rupture of the tympanic membrane.

Case Presentation: A reported a case of barotrauma with perforation of bilateral eardrums in a 76 year-old female, victim of a recent tornado in Maryland. The victim suffered multiple injuries after being swept up and thrown 150 yards in a F4/F5 (most severe on the Fujita-Pearson scale) tornado, with winds in excess of 275 mph. The victim was in her kitchen when the tornado struck her house. Her body was found under a pile of debris that were the remnants of her house, by a ravine, 150 yards from the cinder block foundation, the only part of the house remaining. In addition to having extensive blunt force injuries, the body was covered with mud. Mud was especially dense around the mouth, nose, and ears, an additional indication of the force produced by the pressure differential between the atmosphere and the body cavities.

Conclusion: Tornadoes harbor powerful destructive forces. Their mechanics and physics are still being explored and slowly understood. This case is reported in the hope of adding to understanding the effects of these forces on the human bodies.

Tympanic Membranes, Barotrauma, Fujita-Pearson Scale

D12 Autoerotic Death Investigations— Validating Training Doctrine

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The goal of this presentation is to report findings of research and case studies to validate investigative training to ensure investigators properly recognize the signs of an autoerotic death.

The U.S. Army Criminal Investigation Command (USACIDC) investigates unattended deaths on Army installations and active duty soldier deaths wherever they occur, assisting medical examiners in determining the manner of each death.

The U.S. Army Military Police School is responsible for agents' institutional training and develops doctrine covering the manner in which investigations are conducted by identifying characteristics of types of deaths. Per current doctrine, investigators are taught that autoerotic deaths are accidental and can be recognized by identifying the following characteristics: 1) male, 2) secluded area, 3) padded ligature, 4) escape mechanism, 5) signs of prior use, 6) nudity or female clothing, and 7) pornography. This doctrinal guideline was established over 20 years ago and has changed little. Students are also taught to investigate all deaths as homicides until proven otherwise. The cause and manner of death determinations must be based on the entire investigation, and the presence of these seven characteristics at the death scene should not inappropriately focus the investigation to the exclusion of any other possible outcomes.

This paper will describe different types of hypoxic autoerotic activity, including ligature strangulation, inhalant use, suffocation, and electrocution, and define each criterion as it relates to the cause of death.

A retrospective study was conducted of Army CID reports of investigation initiated from Jan 1, 1990, through December 31, 2001. A total of 22 investigations concluded the deaths resulted from autoerotic activity. Demographic information, i.e., gender, age, race, and military rank and occupation, was extracted from each report and is presented in this paper. Each report was reviewed for the presence of characteristics

meeting the definitions of the seven criteria.

This presentation will validate the training doctrine, in that the seven death scene indicators were present in one form or another in each case or in a majority of the accidental autoerotic deaths reviewed. Consideration should be given to replacing "padded ligature" with "hypoxic activity" since sexual asphyxial activity is no longer confined to ligatures. Ligatures and their padding would still be taught as examples of hypoxic activity.

This doctrinal approach has served the USACIDC well and has undergone Congressional scrutiny in at least one instance in the 1998 death of a soldier whose parents were not convinced with the outcome of the investigation.

Autoerotic Death, Crime Scene Examination, Army CID

D13 Genetic Structure and Evolutionary History of 14 Amerindian Tribes of the Amazonian and Orinoquian Regions of Colombia Based on Seven Loci Y-Chromosome STR Haplotype: A Comparison With the Linguistic Affiliation

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The goal of this presentation is to study the genetic structure of Amerindian populations based on Y-chromosome STR haplotypes.

The genetic structure and evolutionary history in 157 individuals from 14 Amerindian tribes of Colombia belonging to four linguistic families Arawak (Curripaco and Piapoco tribes), Macú-Puinave (Puinave and Nukak tribes), Guahibo (Guahibo and Guayabero tribes), and Tucano (Cubeo, Desano, Piratapuyo, Tatuyo, Tucano and Wanano tribes) based on 7 loci Y-chromosome STR haplotypes (DYS19, DYS389-I, DYS389-II, DYS390, DYS391, DYS392 y DYS393) have been determined. A total of 59 haplotypes were identified with a haplotype diversity of 0.9553. The most frequent haplotype was H29: 13,12,30,24,10,15,13 (14%); followed by H17:13,12,30,23,10,15,13 (8.92%); H45:13,13,30,24,10,14,13 (8.3%); and H10:13,14,32,24, 10,15,13 (5.73%). A comparison of the Amerindian haplotype with the Caucasian Mestizo and Afro-Colombian populations showed that only 2.75% of the Amerindian haplotypes were shared with these ethnic groups.

The AMOVA showed that 36% of the genetic differences were due to differences between groups ($F_{st} = 0.3672$, $p < 0.00000$), a result likely due to genetic drift. In addition 25% of the genetic variation was due to differences in linguistic affiliation. The genetic data has been correlated with the geographic and linguistic classification using similarity dendrograms, Mantel test, and Multidimensional Scaling analysis. The results indicate that the Amerindian tribes have evolved in the genetic, linguistic, and geographic aspects in a highly correlated fashion.

A median network analysis for the entire continent was carried out in order to determine the Ancestral haplotype as well as the most recent common ancestor (time of entry into America) for the Amerindian population. This analysis included a total of 465 individuals from 35 Amerindian, Na-Dene, and Skimo-Aleutian populations described in the literature. The ancestral haplotype found was H45:13,13,30,24, 10,14,13, and the time of entry into the continent was 22300 ybp (15695-28905 ybp) corroborating previous findings based on archeological data and mtDNA analysis. Thus, Y-STR haplotypes represent a powerful tool

for anthropological studies in order to reconstruct the evolutionary history of human populations.

Y-Chromosome, STR, Amerindians

D14 Forensic Reports: Addressing the Challenge of Clarity

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Participants attending this presentation will learn potential strategies to be employed when designing forensic biology laboratory reports. The focus is to ensure that data being presented in a report to clients are both scientifically accurate and understandable to the layperson.

A continuing and significant challenge to forensic scientists is the effective and clear communication of complex scientific findings to lay people in reports and through testimony, while stressing limitations. While challenging, it is arguably the single most important function of a forensic scientist.

During the mid 1990s a judicial inquiry into the wrongful conviction of Guy Paul Morin (The Kaufman report) was initiated. A lack of clarity of scientific findings and a misunderstanding of the potential significance of scientific evidence contributed in part to the miscarriage of justice.

Amongst the Commission's various recommendations, several dealt specifically with the issue of clarity in scientific communications (whether they be reports, case conferences, or testimony).

Recommendation 6: Forensic opinions to be acted upon only when in writing.

Recommendation 7: Written policy for forensic reports. CFS to establish a policy that reports must contain the conclusions drawn from the forensic testing and the *limitations* (emphasis added) to be placed upon those conclusions.

Recommendation 8: The use of appropriate forensic language. CFS to establish a policy for the use of certain uniform language, which is not potentially misleading and enhances understanding.

Recommendation 9: Specific language to be avoided by forensic scientists. CFS employees should be instructed to avoid demonstrably misleading language e.g., the term "consistent with."

Recommendation 10: Specific language to be adopted. Certain language enhances understanding and more clearly reflects the limitations upon scientific findings.

As part of its strategy to implement the recommendations, the CFS struck a cross-organizational committee of staff and managers to propose and review a variety of options. Part of this process involved canvassing stakeholder opinion from crown attorneys, defense counsel, police, coroners, and others, through the administration of focus groups.

Using the information gathered, along with the collective input from the management and staff (numbering approximately 175), a revised report writing policy was drafted. The policy standardizes the format of reports that originate from any one of a number of different disciplines within the laboratory, and requires that discipline-specific general information sheets accompany them.

The standard format of all CFS reports includes the following: i) a Purpose Statement, ii) a Results section, iii) a Conclusion section, iv) a Notes and Remarks section containing information on technical assistance, sample consumption, and reference to other CFS reports, v) a Continuity section containing details of item receipt and disposition, as well as vi) an Attribution Statement.

The information sheets, written at a basic level for the benefit of stakeholders, are formatted in a standard manner throughout the laboratory and include for each discipline: i) a brief introduction, ii) an overview of the process for examination including a description of the various tests used, as well as limitations of the tests, and iii) a glossary of scientific terms that may appear in the report. The example provided below is from the information sheet for blood.

This presentation describes the process undertaken to deal with this complex issue. A sample report from the Biology Section of the CFS involving results of body fluid examinations and STR DNA analysis will be included, accompanied by the appropriate information sheets.

The development of reporting formats and guidelines is an ever-evolving process that must be continually reviewed in the context of each laboratory's requirements. It is felt that the author's approach to the problem has been comprehensive while reflecting the needs of clients.

Exemplar Information Sheet for Blood

Introduction: Blood is a liquid that circulates through the body, transporting oxygen and nutrients and removing waste products. Blood consists of a liquid called plasma in which blood cells are suspended. Hemoglobin is a component of blood.

Examination For the Presence of Blood: Items are visually examined for any staining that may contain blood. Stains are tested using the Kastle-Meyer test. Stains may also be tested to identify the species from which they originated.

Tests For the Presence of Blood:

Visual Examination—May involve using a stereomicroscope (a magnifying tool) and enhanced light sources.

Kastle-Meyer Test—A 3-stage chemical test that gives a pink colour reaction in the presence of hemoglobin, a substance specific to blood. This can be performed as a rub or direct test.

ABACard® HemaTrace® Test—Tests used to determine the species / family of origin of a body fluid or tissue.

Crossed-over Electrophoresis—These tests use commercially prepared reagents that bind specifically to substances in a given species or family, allowing for their visual detection.

Limitations:

1. The sensitivity of the Kastle-Meyer testing is such that a positive result may still be obtained in the absence of visible staining.

2. Although false positive Kastle-Meyer reactions are sometimes obtained with other substances, such as certain fresh plants, as applied at the CFS this test is specific for blood.

3. The ABACard HemaTrace test is specific to human (higher primate) blood. False negative results are possible when dealing with severely degraded samples. False positive results have been observed when ferret blood is tested.

4. The species/families that can be identified using crossed-over electrophoresis are human (higher primate), dog (domestic dog, wolf, coyote), cat (domestic cat, cougar), cow, pig, horse, donkey, mouse/rat, deer/moose, sheep/goat, chicken, guinea pig, rabbit, and fish.

Glossary:

Direct Test —Involves applying the Kastle-Meyer chemicals directly to a sub-sample from the area in question.

Rub Test—Involves rubbing the area in question with paper and applying the chemicals to the paper.

Report Writing, Clarity, Limitations

D15 Genetic Admixture Based on Y-Specific STR Haplotypes in a Sample of Caucasian-Mestizo and African Descent Male Individuals of Colombia

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The goals of this presentation are to establish a population database of Y-STR haplotypes to be used in forensic work and to analyze the genetic structure and genetic admixture in the Colombian population.

Eight loci Y-Chromosome STR minimal haplotypes were analyzed in 134 unrelated African descent individuals collected in four different towns of the Choco department and 137 unrelated Caucasian Mestizo individuals from the east-central Andean region of Colombia, in order to establish haplotype frequencies to be used in forensic casework and to evaluate their genetic relationship in order to correlate previous findings with autosomic markers. No evidence of population sub-structuring for the African descent population was found (χ^2_{st} value 2.6%, p 0.054). Only six out of 232 haplotypes were shared between these two ethnic groups (2.59%). Three out of these six haplotypes were the most frequent haplotypes found in Colombian Caucasian Mestizos implying a genetic flow from Caucasian into African descent individuals. Genetic distance analysis showed clustering between the Caucasian mestizo population with other Caucasian populations found in the Iberian Peninsula (Andalucia, Galicia, Portugal) and other European populations; these results are in agreement with historical data since the Colombian Caucasian population are descendants of Spanish conquerors that arrived more than 500 years ago in these lands. On the other hand, the African descent populations clustered with other African descent populations reported in the literature such as the Afro-American populations and the Afro-Caribbean population from Surinam.

The haplotype diversity for the African descent population was 0.9955 and 0.9971 for the Caucasian mestizo population. However, a lower Power of Discrimination for the African descent population (0.8082) than that obtained for the Caucasian mestizo (0.8905) was observed. The results for the Afrocolombian population of the Choco department could be due in part to a limited gene pool that has remained unchanged for the last 350 years with little admixture with other ethnic groups, limiting the effective size of Y-chromosome haplotypes in this population.

Y-Chromosome, STR, Genetic Admixture

D16 The Role of Radiography in the Forensic Investigation of Mass Incidents

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The goal of this presentation is to review the role of radiology in the forensic investigation of mass incidents and present guidance for planning of effective forensic radiology services within temporary mortuary situations.

This presentation will acquaint the audience with the work of the Trauma Imaging Group Forensic Radiography Sub-Committee (UK), which has reviewed the requirements and practical considerations for the provision of effective forensic radiology services within emergency temporary mortuaries to assist with the investigation of Mass Incidents.

The committee has produced guidelines for the design, equipping, and operation of on-site forensic radiology facilities within temporary emergency mortuaries, which it believes, will be of interest to the forensic community.

Radiological imaging is a powerful tool in forensic medicine. It is widely used to determine cause of death or injury, to assist in the identification of deceased persons, or in the investigation of non-accidental injury in children or the elderly (NAI). Whilst most cases involve the radiological examination of an individual, radiology is

playing a significant and increasing role in the investigation of mass disasters, terrorist incidents, war crimes, and large-scale human rights abuses.

Large-scale investigations of this nature require detailed organization and the rapid deployment of teams of forensic professionals for the recovery of the deceased and their subsequent autopsy examination within a temporary facility designed for this purpose. The provision of appropriate radiological facilities within such temporary mortuaries is dependent upon the creation of a suitably designed and equipped operating environment which complies with health and safety guidance and statutory regulations for the use of ionizing radiations, together with the deployment of suitably trained staff working to well defined operational procedures.

The precise requirements for radiological facilities in the investigation of mass incidents will be dependant upon the nature of the incident under investigation. However, radiology frequently occupies a key role in the investigation or identification procedure. Despite the important nature of the role of radiology and the need for detailed plans to be in place, the provision of radiology facilities is often overlooked by those responsible for Emergency Planning, and has frequently relied on *ad hoc* arrangements for requesting equipment and staff from local health-care facilities.

It is important that those undertaking such forensic examinations are appropriately trained and equipped to practice in this challenging field, as they will often be required to work in less than ideal locations and circumstances. The operation of a successful radiology facility in field conditions requires detailed planning and training and many of the healthcare professionals called upon to assist are ill-equipped to respond to large scale incidents of this nature.

Drawing on experience of incidents in the United Kingdom, The Republic of Ireland, The Former Yugoslavia and Sierra Leone, the Trauma Imaging Group Forensic Radiography Committee has reviewed the requirements for the provision of an appropriate forensic radiology service within the temporary mortuary environment. The committee has produced guidelines for the design, equipping, and operation of on-site forensic radiology facilities within temporary emergency mortuaries, and has been called upon to advise a number of central and local government organizations within the United Kingdom.

This presentation will outline the history of radiography in the forensic investigation of mass incidents, its main uses and the potential for further development. It will examine the role of the radiographer/technologist within the forensic team, and the importance of training and familiarity with legislation and guidelines that underpin good forensic practice.

It will review the current organization of forensic radiography services for the investigation of Mass Incidents and highlight some of the practical problems encountered by those asked to provide the service. It will discuss possible solutions that may be adopted when planning for such incidents, detailing the necessary training, organization, protocols, and equipment to be considered.

Forensic Radiology, Mass Disasters, Emergency Planning

D17 The Triage Station: Recent Advances in Mass Fatality Incident Morgue Operations

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Participants will learn about mass fatality incident morgue operations, with a specific focus on the flow of human remains through the identification process. Emphasis is placed on the development of the triage station and its role during the investigation of several recent mass fatality incidents.

1. Mass fatality incident morgue operations have evolved through time as the experience of responding agencies continues to grow. A cursory examination of mass fatality incident training manuals from the previous fifteen years indicates an increase in the flexibility of morgue design to address incident specific issues and challenges. In addition, morgue operation complexity has increased through time with the implementation of additional investigative disciplines. A relatively new development is the “Morphology” or, Triage station. When utilized, Triage is the first station to receive human remains after documentation at the Admitting/Processing station. Station staff may include a combination of the following specialties: a Medical Examiner’s Office representative, a pathologist, odontologist, anthropologist, fingerprint analyst, DNA specialist, personal effects representative, law enforcement (ordinance detection expert, etc., as needed), and photographer. Triage stations have been incorporated into morgue operations during the initial stages of the 1999 Egypt Air Flight 990 crash investigation by Disaster Mortuary Operational Response Teams (DMORTs). This station was also utilized at the United Flight 93 investigation, and in a remote fashion (i.e., not in the same facility as the morgue), during the World Trade Center investigation. To date, there has been relatively little formal discussion concerning the operational focus and goals of this essential station, which can be defined as follows:

2. Development of a disaster specific numbering and tracking system in close collaboration with the Admitting/Processing section. This function ensures proper coordination of numbering systems developed and implemented independently during the recovery process. Different agencies are oftentimes responsible for the search and recovery, and for morgue operations (as was the case for the Korean Air Flight 801, Egypt Air Flight 990 and World Trade Center investigations). Proper coordination is essential for the maintenance of a chain of custody and any pertinent provenience data gathered at the scene, which could be useful for decedent identification.

3. Establish a proper chain of evidence within the morgue, in close collaboration with the Admitting/Processing section.

4. Address contamination issues before invasive study.

5. Determine if remains are human tissue, non-human tissue, or non-biological tissue.

6. Identify and maintain the integrity of non-biological evidence. For instance, wiring embedded within muscle tissue should be evaluated and taken into custody by the proper specialist at the Triage station prior to manipulation by other morgue workers, thus preventing the potential destruction of evidence during subsequent examinations.

7. Determination of commingling and separation of remains, with subsequent modification of the assigned tracking numbers. It is imperative that these functions occur as early as possible in the morgue operation to minimize the possibility of tracking errors, which could potentially weaken the proper chain of custody.

8. Classification of decedent remains as viewable vs. non-viewable before performing facial incisions, oral autopsy examinations, or removal of fingers.

9. Determination of common tissue classification. Which fragments are considered identifiable? What specific identifiable features are present on each tissue fragment? This function allows station personnel the ability to document tissue morphology, and decide on the potential for successful non-molecular identification of the tissue, and thus obviating the need for further examination at subsequent stations if deemed unnecessary by Triage station representatives. All policy issues concerning common tissue classification should be coordinated with representatives from the proper agencies (i.e., Medical

Examiner’s Office, etc.).

10. Determination by a DNA sampling specialist for the need to procure samples. A recent paradigm shift in decedent identification has placed increased reliance on DNA identification of decedents. The DNA sampling specialist will assess sampling potential and the need for immediate sampling to prevent the possibility of further degradation or contamination due to invasive study by subsequent morgue stations.

As outlined, the Triage station functions to streamline morgue operations, allowing investigators to rapidly assess the condition of remains and level of commingling, both key variables in identification success. Of paramount importance is the ability to modify the aforementioned functions based on incident specific requirements, as will be discussed during the presentation.

Mass Fatality Incident, Morgue Operations, Triage Station

D18 A Mass Fatality Identification Guide for Medical Examiners and Coroners

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The goals of this presentation are to discuss a new guide written by the Mass Fatality Incident Technical Working Group (MFIITWG) of the National Center for Forensic Sciences (NCFS) and underwritten by the National Institute of Justice (NIJ).

The NCFS MFIITWG first met in June of 2001 to prepare a guide tentatively titled, “Mass Fatality Incidents: A Guide for Human Forensic Identification.” The intended audience was the smaller local medical examiner and coroner offices who had neither the physical plant nor financial resources to support the identification of a large number of human remains.

The members of the group included nationally recognized leaders in their fields with first-hand experience in the mass fatality arena. The MFIITWG was divided into committees covering 1) Administration and operations, 2) Medical Examiner/Coroner, 3) Physical Anthropology, 4) DNA, 5) Fingerprints, and 6) Odontology.

The group met either in person or by conference calls over the past year to brainstorm ideas, formulate a rough draft, ask the forensic community for peer review, and finally complete a final consensus document for publication.

An overview of the completed document will be presented to the forensic community to familiarize them with its content.

The date of publication and how to obtain the document will be discussed. Other ongoing work of the NCFS will also be presented.

Guide, Mass Fatality, Identification

D19 The Use of Electronic Data Collection Technology in Crime Scene Documentation

Joseph A. Keierleber, BA, MFA, MTC Forensics, 371 Fore Street, Portland, ME*

The goals of this presentation are to review the state of electronic data collection technology, explain its current applications in crime scene work, and propose potential uses that merit further development.

In the field of forensic engineering, particularly the specialty of vehicle crash reconstruction, the use of electronic data collection technology has been well known for several years. Foremost in this field has been the use of the electronic surveying package, commonly known as the “total station.” The total station migrated from its non-forensic

uses in civil engineering to the realm of forensic engineering, where it has been used successfully to map crash sites, measure crush depth of vehicles, and record data for later use in the creation of computer animations. Nearly all of the forensic literature on the use of the total station is related to its applications in accident reconstruction.

An underutilized application of the total station and other electronic measuring equipment is in the mapping and documentation of non-vehicular crime scenes. Despite its origins as a land surveyor's instrument, the total station is not limited to outdoor use. Compared to traditional tape measure methods of collecting data, the total station offers the advantages of faster data collection, greater precision, elimination of transcription error, and easier transport of data between systems as well as between agencies. Furthermore, the total station allows measurement of distances and angles in three dimensions as opposed to the two dimensions measured by traditional methods. The techniques of total station mapping during archaeological excavations have been borrowed for forensic use, and have proven to be invaluable in the documentation of clandestine burial sites, mass graves, and crime scenes spread over large areas. Other situations in which the total station has been used are documentation of shooting scenes and disaster sites.

An essential complement to the electronic surveying instrument is computer-aided drafting (CAD) software. CAD software permits the data collected at the crime scene to be analyzed quantitatively and provides a means of producing scaled diagrams of the scene, as well as three-dimensional digital models of the scene that may be used in computer animations. On its own, CAD software provides a precise means of making measurements of features depicted in crime scene photographs. This technology is ideal for crime reconstruction, bloodstain pattern analysis, photogrammetry, and creation of courtroom exhibits.

Other electronic data collection devices with forensic applications include laser-distance measurement units, global positioning system (GPS) receivers, and geographic information systems (GIS).

Crime Scene, Mapping, Technology

D20 Digital Evidence as A New Forensic Science Discipline

Carrie M. Whitcomb, MSFS, National Center for Forensic Science, P.O. Box 162367, Orlando, FL*

The goal of this presentation is to inform the audience of courses of action for developing a new forensic science.

In the 1980s, law enforcement began to seize computers and other digital media as potential sources of evidence, just as they had seized business and personal records, letters, diaries, and ledgers previously. Law enforcement used commercially available software "tools" to assist in uncovering latent evidence on hard drives and other electronic storage media. Eventually they began to develop software themselves and vendors began producing forensic software tools. The capacity of computer drives increased and the magnitude of the technology increased. The seized information increased from gigabytes to terabytes, and the work became more complicated. Software was developed that could perform automated searches to elicit specified evidence from large amounts of data.

By the mid- to late 1980s, computers were beginning to show up in forensic laboratories as submissions. In the 1990s, this trend increased and by 1998, the FBI sponsored the formation of the Scientific Working Group for Digital Evidence (SWGDE) in order for the forensic science and investigative communities to develop definitions, best practices, and examination protocols for the collection, preservation, transport, and examination of digital evidence. In 2000, SWGDE approached the American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB) concerning the possibility of

developing an accreditation document for digital evidence. By fall of 2002, this draft document was ready to go before the ASCLD/LAB Delegate Assembly for a vote.

If the accreditation of Digital Evidence Sections in Forensic Laboratories is passed by ASCLD/LAB's Delegate Assembly, the next steps will follow as for all other disciplines: a Proficiency Advisory Committee (PAC) must be formed utilizing experts in the field, and quality assurance programs including competency testing, proficiency testing, and tool validation will follow. Other issues that may follow include:

- Degrees and certificate programs in Digital Evidence areas
- Continuing Education & Training
- Professional Certification
- Professional Journals
- Digital Evidence Sections in Professional Organizations

Computer crimes are a growing national and international problem, with the criminal being in one country and the victim in another country. In order to facilitate communication and the exchange of evidence, the law enforcement, forensic science, and legal communities from the various countries must be able to interact through a mechanism that is recognized by all participants. It is the author's opinion that an international consortium for digital evidence should be formed by existing organizations. This consortium could be a focal point for professionals involved in digital evidence collection, examination, investigations, and litigation.

Digital Evidence, New Forensic Science Discipline, Digital Media

D21 Second Impressions - Can Specific Murder Weapons Be Associated With the Gender of the Perpetrator?

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After attending this presentation, the participant will understand the importance of 1) the team approach to focus an investigation, 2) the development of an investigative strategy, and 3) conducting a thorough crime scene analysis.

Shauna Card was an attractive 17-year-old high school senior. She was a friendly girl who often did volunteer work at a local hospital. She had no known enemies. Her parents were divorced and she had previously lived with her father and stepmother. Due to conflicts with her father's new wife, Shauna moved in with her mother in a two bedroom, two-bathroom apartment. Their unit was located towards the front of a very large apartment complex. Shauna did not have a car and she rode the school bus each day along with many of the other students from the apartment complex.

Shauna was an only child and she was deeply troubled by her parents' divorce. Her grades were suffering from her inner turmoil. Shauna's psychology teacher suggested that she write down her thoughts in a journal to help focus her feelings.

Shauna was last seen at approximately 1430 hours on January 31, 1995, as she was walking from the school bus to her apartment. Her mother arrived home from work at approximately 1800 hours. She used her key to enter the apartment, but she did not note if the door was indeed locked. She noticed that the light was on in the hall bathroom and the door was slightly ajar. She called out Shauna's name but when she received no answer, she looked into the bathroom.

Shauna was lying on her back in a pool of blood on the bathroom floor. She was fully clothed in the same garments she wore to school that day. She had sustained a large bruise to the area of her right eye and she had been stabbed multiple times in the face, neck, and back. Two butter knives, one steak knife, and a pair of scissors were lying next to her body. A steak knife, a butter knife, and a potato peeler had been

returned to the kitchen and placed in a cabinet under the sink. These items all contained the victim's blood. Numerous 90-degree blood drops were discovered on the kitchen floor. Blood was also found on a towel in the living room, on a sweatshirt in her mother's bedroom and in the sink trap in the master bathroom.

A motive for this crime was not readily apparent. There was no indication of forced entry into the apartment.

The victim was fully clothed and there was no indication of a sexual assault. The apartment did not appear to have been searched. No items of value were missing. None of Shauna's fellow students or neighbors knew of anyone who was angry with her.

The use of the kitchen tools, i.e., potato peeler, scissors, butter knives, and steak knives, became a potential stumbling block in the investigation. Did the choice of these specific weapons mean that this was a feminine crime?

This presentation will take the attendees through the crime scene, the forensic evidence, and the investigation that led to the arrest and conviction of Shauna's murderer.

Homicide, Blood Spatter Interpretation, Crime Scene Analysis

D22 Gestures: Their Linkage to Veracity and Accuracy

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The goal of this presentation is to examine how the assessment of hand and arm gestures can assist in determining the veracity and accuracy of a subject's recollection or accounts of a criminal event. This may help to provide Law Enforcement or the Forensic Behavioral Science Community a clinical and objective assessment approach to determining veracity and accuracy during criminal interviews and interrogations.

This presentation will discuss a pilot study and practical application that involve the assessment of hand and arm gestures to determine accuracy and veracity during criminal interviews and interrogations, identified by this author as "Gesticular Probing." This interviewing technique evolved from a theory suggested by Professor David McNeill, of the University of Chicago, that gestures, speech, and thought are a single integrated system, and that gestures exhibit images that cannot always be expressed by speech, as well as images the speaker thinks are concealed. McNeill further relates, "Gestures are like thoughts themselves . . . they belong, not to the outside world, but to the inside one of memory, thought, and mental images."

During the pilot study, the investigator attempted to determine the differences between deceptive and truthful subjects by (1) the prevalence of specific types of gestures (metaphoric, iconic, beats, cohesive, deictic, and other gesticular activity); (2) the presence of significant features during the three stages of gesticulation (preparation/beginning, stroke, retraction/return); and (3) the overall use of gestures during the account of a criminal event.

The pilot study had subjects view a video of a criminal event and describe what they observed while being videotaped. During the pilot study some subjects were instructed to lie about something they observed. Due to the small number of subjects used in the study, analysis of the study's findings was conducted through qualitative-observations.

The results suggested that there appears to be no significant correlation between a subject's veracity and the prevalence of particular hand or arm gestures during the subject's recollection of a criminal event. What was noticed was that observing the subject's entire sequence of gestures provided information that gave the interviewer a sense of truthfulness and/or deception. In addition, an identical hand gesture was observed in three subjects who provided spontaneous

misinformation (lies). This hand gesture was a palmer side down than up just before the lie was provided by the subject and was identified by McNeill as a "presentation gesture." This particular palmer side down than up gesture was detected in slow motion and could not be easily observed in "real-time." Paul Ekman may describe such behavioral activity that an individual makes unknowingly when he/she lies as "leakages" of deception.

The "Gesticular Probing" technique was used during actual criminal investigations, probing witnesses and suspect's hand and arm gestures. The subject's gestures were assessed from a continuum (beginning to end) in which each gesture becomes more detailed than the previous during the interview/interrogation process. The subject is asked to describe and illustrate in more detail what he/she has already related to the investigator. The subject will initially display a minimum of gesticular activity and tend to display more gesticular hand and arm activity as the event is described in more detail. The interviewer will peel away at this added hand and arm gesticular activity frame-by-frame and begin to get a visual image of the subject's thoughts. The "Gesticular Probing" technique is a non-intimidating style of interviewing, minimizing gesticular influence from verbal intent by the interviewer or gesticular mirroring.

During the actual criminal investigations, the investigator was able to observe gesticular displays in real-time by subjects that tend to contradict spatial or gesticular activity that appears to be mismatch with the real circumstances of the criminal event, such as how a victim was found or how a weapon was used. The investigator also found that subject's tended to over or de-emphasizes gesticular activity when providing erroneous or inaccurate information.

The traditional observations by investigators of identifying good and bad gestures or the lying and truthful type of gestures, grouping these types of gestures into clusters to make assessments of deception and non-deception, still have value to the investigator. The "Gesticular Probing" technique does not assess what may be considered a good or bad gesture; instead, it attempts to isolate gesticular behavior from a continuum of gesticular activity that may illustrate discrepancies or information that is not in sync with the factual occurrence of a criminal event. The investigator may become a more objective inquisitor and begin to read the images of the mind as McNeill suggests.

Gesticular Probing, Peeling, Frame by Frame

D23 Characterization and Profiling of Illicit Methamphetamine Tablets Abused in Singapore

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The goal of this presentation is to provide law enforcement agencies with information in establishing possible links between different seizures of illicit methamphetamine tablets.

Outcome: Based on the methamphetamine content, the major components found and the minor impurity profiles, it is possible to classify the illicit methamphetamine tablets into groups for the purpose of providing a link between these tablets. Adopting an impurity profiling method similar to that of UNDCP Laboratory enables the laboratory to compare its results with those of UNDCP and other studies to shed some light on the origins of the illicit methamphetamine tablets abused in Singapore.

The abuse of methamphetamine in Singapore has been on the rise since mid 1997. While many of the exhibits submitted to the laboratory are in the crystalline form as methamphetamine hydrochloride, known commonly by its street name "ice," a significant number of the

methamphetamine exhibits are in the form of tablets.

Most of the illicit methamphetamine tablets are believed to be manufactured in the "Golden Triangle" region and smuggled into the country. They have multi-colors and logos and are easily confused with the "Ecstasy" tablets that are also being abused in the country. This paper will present the results of a study undertaken by the laboratory on the characterization and profiling of the illicit methamphetamine tablets. While it may be difficult to identify the possible sources of these tablets since they are manufactured outside the country, it is hoped that the information will be useful to law enforcement agencies in establishing possible links between the different seizures and identifying the distribution networks.

Approximately 200 samples of methamphetamine tablets were used in the study. These tablets were collected over a period of about 4 years, from 1998 to early 2002. Based on the methamphetamine content and the major components found, the tablets could be broadly divided into 2 groups. The first group of tablets had a methamphetamine content ranged from 3% to 29% and usually contained caffeine as the only other major component. This group of tablets came with few colors and only 2 logos were seen so far. The second group of tablets had a methamphetamine content varied from less than 1% to about 11% and consisted of tablets with a great variety of colors and logos. They generally contained several other major components other than methamphetamine. Components found so far included caffeine, diazepam, ketamine, dextromethorphan, ephedrine (or pseudoephedrine), lignocaine, midazolam, paracetamol, and triprolidine. Of these, caffeine and ketamine were the most commonly found. Many of these components were present at a much higher concentration than methamphetamine.

A detailed impurity profiling study was conducted on the first group of the methamphetamine tablets since they have relatively simple composition and are usually being trafficked in large numbers. The method of impurity profiling adopted by the laboratory was based on that reported by the United Nations International Drug Control Programme (UNDCP) Laboratory.⁽¹⁾ It involves dissolving the powdered sample in a phosphate buffer solution at pH 10.5 and extracting the solution with ethyl acetate. The extract was then analyzed by GC/FID and GC/MS using n-tridecane, diphenylamine, and n-tetracosane as the internal standards. Using this method, the impurity profiles of a total of 46 samples were studied. The results show that over the years from 1998 to 2002, the main impurities found in this group of tablets appeared to be similar. Some of the common impurities found were benzaldehyde, 1,2-dimethyl-3-phenylaziridine, amphetamine, N-acetylmethamphetamine, N-formylmethamphetamine, ephedrine, N-acetyephedrine, acetyl-codeine, codeine and ethyl vanillin. Of the common impurities, codeine and acetylcodeine appeared to be not related to the manufacturing process. They were likely to be contamination from utensils from premises that were also used in the manufacturing of heroin. In the case of ethyl vanillin, it was probably added as a flavoring agent.

To have a better understanding of the synthetic route used in the clandestine manufacturing of methamphetamine, the optical purity of the compound in 26 samples was determined using GC/FID fitted with a chiral column. The results show that in all samples, only the more potent *d*-methamphetamine was found indicating that either the optically pure *l*-ephedrine or *d*-pseudoephedrine was used as the starting material.

An impurity profiling study was also carried out on selected samples of the second group of methamphetamine tablets which had higher methamphetamine contents (8-11%). In addition to the major components described earlier, some minor impurities found were benzaldehyde, amphetamine, N-formylmethamphetamine, MDMA, and 1-(3, 4-methylenedioxyphenyl)-2-propanol.

Based on the methamphetamine content, the major components found and the minor impurity profiles, it is possible to classify the illicit methamphetamine tablets into groups for the purpose of providing a link

between these tablets. Adopting an impurity profiling method similar to that of UNDCP Laboratory enables the laboratory to compare its results with those of UNDCP and other studies² to shed some light on the origins of the illicit methamphetamine tablets abused in Singapore. B. Remberg and A.H. Stead, *Bull. Narcotics*, L1, 1999, 97-117
V. Puthaviriyakorn, *et. al., Forensic Sci., Int.*, 126, 2002, 105-113

Methamphetamine, Impurity, Profiling

D24 Therapeutic Accident With Antibiotics and Lyell's Syndrome

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Lyell's syndrome almost always occurs after taking medication and mortality is high, particularly due to infectious complications. Despite spectacular clinical signs, it is mainly diagnosed with pathologic techniques. The involvement of a drug as sole cause of such an allergic reaction must be demonstrated, especially since the molecule incriminated is not generally known to be a classical cause of this reaction. The imputability is based on a number of clinical arguments. The present study describes a female patient who rapidly developed an extensive bullous toxidermia after taking clarithromycin for tonsillitis. The case illustrates the process involved in attributing imputability to a molecule.

Lyell's Syndrome, Imputability, Clarythomicine

D25 Voluntary Community DNA Testing

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The goals of this presentation are to describe the best practice and procedure for Law Enforcement Agencies in conducting a voluntary based DNA screen in a serious crime.

During the early hours of New Years Day 1999, a 91-year-old resident of the township of Wee Waa went to bed. Rita Knight had lived all her life in the outback town of Wee Waa, some 600km NW of Sydney, New South Wales, Australia. She was a highly respected person who had lived all her life in the same house. A regular churchgoer, this wonderful woman did not have an enemy in the world.

Later that night, someone broke into her house and attacked her in bed. She was beaten and then suffocated unconscious, and as a final indignity raped whilst unconscious. Despite her appalling injuries she survived. The shock and horror of this attack stunned the community. A massive police investigation worked for many months, but sadly failed to trace the offender. The only clue left to the police was a DNA profile from semen in the vaginal swab.

Due to community pressure, 16 months later the police set about taking voluntary DNA samples from all 600 males in the Wee Waa community. A criminal and geographic profile set guidelines for the screening. This screening was the first intelligence led DNA screen in Australia. The exercise received enormous media coverage in Australia and worldwide including the U.S., in particular NBC news.

There was no legislation at that time in Australia to force men to give a DNA sample. The screening was based on best practice techniques the author had employed in similar investigations in the U.K.

Set criteria have to be met before such a screening is embarked upon. Namely there must be a compact geographic area. The crime

scene DNA sample must be attributable to the offender. Most importantly there must be a supportive community. A media strategy is formulated between the investigating officers and the criminal profiler.

In April 2000, a team of police went to Wee Waa and invited men who fitted the profile to volunteer a DNA sample. The community response was incredible. Over 95% of the eligible male population volunteered samples. They were queuing up outside the police station before opening at 8:00 a.m. each day.

Local detectives already had a list of suspects, but insufficient evidence to support an arrest and interview. Part of the investigating strategy was that these suspects would be invited to give a DNA sample along with a SCAN (scientific content analysis) questionnaire.

One of the suspects left town the day before the police team arrived. Stephen James Boney lived 300 meters from the victim's house. On 11 April 2000, he was traced working on a farm 50 km from Wee Waa. A local Officer interviewed him and requested a voluntary DNA sample. After a minute thinking, Boney gave the sample and completed the SCAN form.

All the samples were then transported back to Sydney for testing and comparison with the crime scene sample. The day before this testing was due to commence, 17 April 2000, Boney surrendered himself to the police at Wee Waa. He admitted being responsible for the attack. A further DNA sample was taken from him along with a full written confession. Comparison of Boney's sample with the crime scene sample proved to be a perfect match. He was then charged with the attack and rape of Rita Knight.

On 20 October 2000, Boney appeared before the Moree District Court and pleaded guilty to all the charges. He was sentenced to 12 years imprisonment. The public of Wee Waa gave unqualified support to the methods used by the police to capture Boney. The template of joining traditional policing with a forensically led approach based on criminal and geographic profiling proved highly successful. This template could be adapted for use in the U.S. in communities where the criteria for such a screening are met.

At the time of the investigation the author was a Detective Superintendent seconded from the U.K. to the New South Wales police in Sydney. He currently works in Perth as Director of Research and Development at the Centre for Forensic Science, University of Western Australia.

Voluntary, DNA, Screening

D26 The Political Realities of Building a High-Tech DNA Identification System in a Post-Conflict Society

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The participants will be given an overview of the inherent difficulties and political realities of building a high-tech DNA identification system in a post-conflict society. It is hoped that the model employed in the regions of the former Yugoslavia could be built upon in other regions of the world.

In the regions of the former Yugoslavia affected by the conflicts beginning in 1991 and continuing, to a lesser extent, in the Former Yugoslav Republic of Macedonia, the International Commission on Missing Persons (ICMP) estimates that there are up to 40,000 persons missing. Most of these persons disappeared as a consequence of actions committed by the regional governments or agents acting on their behalf. In the majority of these cases of "enforced disappearance," governments in the region went out of their way to hide bodies and conceal material evidence that could later be used in court, or more specifically, by the International Criminal Tribunal for the Former Yugoslavia (ICTY).

There is growing consensus that in cases of enforced disappearance, the use of sophisticated DNA technology as a tool to uncover the identity of victims is the most scientifically accurate method. However, in addition to the scientific challenges of implementing a large-scale process of DNA identification in a war torn region, another concern of the ICMP has been how to create a process that is not only scientifically accurate, but also politically neutral in a politically charged atmosphere.

In addition to these hurdles, the ICMP faces the task of introducing a new methodology to a society that has a tradition of deferring to authority.

Addressing these difficulties has ramifications on many aspects of the ICMP's work. These include educating local pathologists regarding evolving identification techniques to encouraging government officials to view the construction of DNA laboratories as a tool to assist the families of the missing, rather than a tool to politically manipulate them. Other difficulties include helping the families through the labyrinth of information and misinformation they are fed regarding the legitimacy of DNA technology in the identification process.

The technical solution to these issues was to create a centralized system that would expedite the process of addressing the approximately 40,000 persons missing from the conflicts in the Balkans. As a consequence, ICMP has constructed five DNA laboratories in the regions of the former Yugoslavia, with one central location for submitting, blinding, and distributing biological samples to the five laboratories. This regional system requires that the governments in the area move away from viewing the labs as "national" centers of identification, to accepting that the laboratories work together on identifications, regardless of the ethnic, religious or national origin of the missing person.

Despite on-going obstacles, the governments in the region have largely agreed to the centralized system. ICMP hopes that the increased levels of identifications now being realized will fully validate the credibility and legitimacy of the DNA-led centralized process, thus allowing the cooperative process of DNA identifications of mass casualties from a recent war to become sustainable.

NA, Politics, Identifications

D27 The Effect of Short Wave Ultraviolet Light on Latent Fingerprints

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The goals of this paper are to present to the forensic community the observed effect of short wave ultraviolet light on latent fingerprints.

This oral presentation will introduce observations of latent fingerprints on non-porous surfaces that received prolonged exposure to short wave ultraviolet light (254nm wavelength). It was hypothesized that effective documentation and recovery of latent fingerprints exposed to short wave UV light for 10 minutes or more may be inhibited due to a chemical breakdown in the protein compounds that compose friction ridge detail in latent fingerprints.

Background: During a project constructed to test the effectiveness of various forensic light sources on biological fluids, the friction ridge detail on latent fingerprints was observed to have darkened after exposure for approximately ten minutes to short wave (254nm) ultraviolet light. However, the shading of the prints, as observed and documented by digital photography, was altered as the UV light was moved at different angles to the fingerprints over the course of the project. At the time, it was not possible to confirm if the darkened fingerprint detail was a result of exposure to UV light or if other factors came into play.

Experimental Method: Latent fingerprints were deposited on non-porous plastic and glass substrates and exposed to a 12-watt germicidal UV light source for up to 1 hour. The observed appearance of the test prints was documented and preserved over time using a forensic light source, video and digital photography. ISO 200 speed film speed was utilized with a shutter speed of one-fourth of a second. The f-stop range for the project was 4.0, 4.5, 5.0, and 5.6. In each series of photographs, only one f-stop setting was used to ensure consistency. Physical recovery of the test fingerprints was accomplished with black fingerprint powder and brush techniques. In all cases, control prints were deposited and recovered from the same or similar substrates using the above techniques.

A darkening of the ridge detail was observed on the latent prints deposited on the glass and plastic substrates after exposures to short wave ultraviolet light of 20 minutes or more. The darkening initially made the ridge detail more apparent, but slowly began to blur the fine edges and eventually led to some of the ridge patterns to appear that they had thickened and joined together. However, there was no readily apparent degradation when the fingerprints were recovered using powder-lift techniques. In every case, the powder-lifted fingerprints were suitable for examination and did not appear to have lost any fine detail.

The friction ridge detail of the latent fingerprints deposited on non-porous surfaces and exposed to short wave ultraviolet light for an extended period of time darkened to the point that photographic documentation was adversely affected. These latent fingerprints were video taped and photographed in five-minute intervals for up to one hour, and gradual darkening and near obliteration of some of the friction ridge detail were documented. The cause of this darkening is unknown, but is hypothesized to be a result of deteriorating protein elements within the latent fingerprint due to prolonged exposure to short wave Ultraviolet light. However, since this darkening did not affect the powder lift method of recovery, it only appears to be problematic when the means of fingerprint recovery is exclusively video or photography. Furthermore, direct exposure to short wave ultraviolet light of more than 20 minutes is unlikely when processing fingerprints in the field. However, the findings reported here might be useful to forensics professionals to prevent any hindering effects short wave ultraviolet light exposure may have on the photographic documentation of evidence.

Further Testing: The effects of short wave UV light remains of interest, especially with regard to protein compounds within fingerprint ridge detail. The project is currently being expanded to include observations of the performance of protein reagents on latent fingerprints after exposure to short wave UV. Latent prints will be deposited on paper and will be chemically recovered using the protein reagent Ninhydrin. Additionally, latent prints will be exposed to other light sources to determine if radiated heat from normal household light plays some role in the observed darkening effect.

Short Wave Ultraviolet Light, Latent Fingerprints, Digital Photography

D28 Developing a Valid Data Base for Determining Crime Trends in Hospitals

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The goal of this presentation is to acquaint the forensic community with the problem of hospital-based crime and the current initiatives by the International Association for Healthcare Security and Safety (IAHSS) to develop a valid database to measure criminal activity, to detect crime trends, and ultimately to measure the effectiveness of

hospital security programs.

This paper will first discuss the problem and extent of criminal activity at hospitals throughout the U.S. It will focus on the lack of a valid database for measuring such activity, and previous efforts to develop one using statistics collected by the International Association for Healthcare Security and Safety (IAHSS) and by the U.S. Department of Education under the Clery Act. The former is flawed because participation is voluntary and varies substantially from year to year, and the latter only includes academic medical centers (those affiliated with colleges and universities required to report campus crime).

The paper will then discuss the IAHSS current initiative, which is designed to obtain crime data from a statistically valid random sampling of hospitals over a ten-year period. The sampling design stratified hospitals based on three variables: bed size (staffed, not licensed), type (general, trauma center, public "safety net" and pediatric), and location (urban and suburban). Hospitals with less than 100 beds have been excluded, since they are typically in rural areas and do not have established security programs. This 3x4x2 matrix totals 24 hospitals. Multiplied by the five IAHSS regions in the U.S., this will provide survey data from a total of 120 hospitals.

All 120 hospitals selected have committed to provide annual crime statistics in a standardized format for a period of ten years. In addition, information regarding their security personnel (number of officers and support staff, level of training, type of vehicles and equipment, patrol methods, etc.), programs (crime prevention, investigations, etc.), and use of technology (access controls, alarms, CCTV, etc.) will be collected. This data will enable the IAHSS to measure the effectiveness of security personnel, programs, and technology in reducing crime in hospitals.

Participating hospitals have been promised anonymity so that their individual crime statistics and security resources will not be publicized. However, the IAHSS will release an annual report to acquaint hospital administrators, law enforcement officials, the academic community, and the general public with criminal activity, crime trends, and security programs in hospitals.

Crime, Hospital, Statistics

D29 An Analysis of Conjoint Roles in Hospitals: The Clinical Forensic Nurse, and Quality Management

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The goals of this presentation are to demonstrate the value of the Clinical Forensic Nurse (CFN) in the identification of staff members responsible for serial killing of patients.

This presentation will outline two cases of serial killings within VAMC settings. In both cases, the keen observations, the management of evidence, and suspiciousness of experienced nurses were key factors in solving the crimes. Due to on-going civil litigation proceedings, certain details will not be disclosed in this presentation.

The first case example includes that of former registered nurse Kristen Gilbert who was found guilty of four counts of first-degree murder and three counts of attempted murder of patients under her direct care. It was the astute observation and persistence of nursing staff that finally opened the door for an investigation.

The second example is that of the notorious Dr. Michael Swango. A nurse who noted highly atypical medical practice patterns conducted the forensic medical record review for the investigation. Her insights helped redirect investigation efforts that led to an eventual break in the case.

In the day-to-day activities of any medical center where patient care is provided, the potential for forensic issues to arise is greater now than

ever. With the *do-more-with-less* mandates, high patient acuties, and a generalized shortage of personnel to manage the patients, personnel experience high levels of stress and often have little or no support or supervision. In addition, in the eagerness to get staff vacancies filled promptly, employee-screening procedures may be abbreviated and background checks, references, and employee histories may lack thoroughness. Furthermore, marginal performing staff members may be retained with the belief that they are better than a vacant position. The short staffing, hectic schedules, chaos and confusion in the highly charged work setting, and personal stresses combine to create the ideal environment in which both serious errors and personal misconduct may occur and yet may go unnoticed. Quality management (QM) has recognized that the employment of a CFN in the hospital setting is one way to assist in the alleviation of preventable, adverse events. The Clinical Forensic Nurse may make significant contributions in patient safety as well as risk management within any medical facility. This nurse is an ideal compliment to any Quality Management Department or Process Improvement Team.

While QM staff of any medical facility may not play the same role as a court of law or jury, they do share one responsibility, root cause analysis (RCA). Sets of data or a collection of facts must be reviewed before a course of action or process improvement plan may be implemented. The plan may entail recommendations to monitor staff competency or a suspicious trend of events. In any case, all must be based upon accurate data and good evidence. Unfortunately, critical information does not reach the QM staff until long after the event. Opportunities to capture specific details about the scene and circumstances as well as the immediate recall of those involved no longer exist. In these litigious times, health care providers are hesitant to admit or to discuss activities that could be viewed as *an error*.

The CFN should be an essential part of any hospital staff charged with RCA in association with adverse patient events. Most medical errors and therapeutic misadventures are not criminal in either intent or nature. However, in all cases, the precise identification, collection, and preservation of facts, data and medical evidence are vital for appropriate resolution and follow-up.

The CFN serves as the critical link between medicine and law, having an increased awareness of forensic implications in every day patient care as well as working hand-in-hand with those charged with investigating patient complaints, suspicious patient events, unexpected death, questionable trends, and emergency / traumatic patient admissions. The CFN is in a position to provide vital protection to victims of foul play when they are at their most vulnerable. In today's health care system, all health care providers should have some level of awareness of what constitutes medico-legal significance. Ideally, facilities would benefit from having a core team of individuals knowledgeable in forensic principles and able to apply these principles to adverse patient care scenarios.

The astute forensic nurse practicing in a clinical setting maintains a professional balance between routine management of "natural" illness and consistently entertaining the possibilities of foul play. The CFN has no bias towards any one element of a patient's case. Human rights will be protected and laws will be upheld without regard for personal or institutional consequences.

As this specialty continues to evolve, clinical forensic nursing practice appears to be developing into 5 different roles: 1) the forensic nurse provider, 2) the forensic nurse examiner, 3) forensic psychiatric nurse examiner, 4) forensic nurse specialist, and 5) the forensic nurse investigator.

It has been established that the vast majority of law enforcement and investigative personnel are not trained to navigate through a complicated medical or surgical area, nor do most comprehend the medical /nursing jargon commonly used within medical facilities. The practice of clinical forensic nursing with its broad focus upon health care expertise, the ability to apply forensic science to the hospital setting and

knowledge of justice system requirements, is the critical link between law enforcement and healthcare practice. Nurses, in general, are key players with immediate access to nearly every activity that occurs in a medical facility. Nurses know other key players, the environment, the language, and routines of daily scenarios with regards to patient care delivery; therefore, they are most likely the ones to recognize irregularities. A nurse who is indoctrinated in the forensic sciences will have an *edge* in spotting even the subtlest of inconsistencies. The unique vantage point and professional perspective of the CFN can serve law enforcement and the criminal justice system, while continuing to act in the best interests of the patients and the hospitals they serve.

It is also possible that in some instances, the administration of any given health care facility would prefer to keep some forensic cases or specific aspects of these cases *under wraps* and decline to report them to external authorities. The desire to handle problems discretely and internally is often akin to *cover-up*. The CFN would ideally be involved in case reporting and disclosure decisions.

The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) has laid the groundwork for the roles of forensic nurse providers and examiners within hospitals in its published scoring guidelines for patient care assessment. Additionally, the Joint Commission includes the review of organizations' activities in response to sentinel events in its accreditation process that opens the door for a CFN specialist and/or investigator.

The unique vigilance of nurses, when combined with analytical skills, a natural curiosity, and a sense of duty, provides the necessary acumen for success in the clinical forensic nursing role.

Clinical Forensic Nurse, Quality Management, Root Cause Analysis (RCA)

D30 An Exploration of the Overlap Between Clinical Quality Assurance Activities and Forensic Medical Investigation

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In this presentation, the audience will gain a newfound appreciation for the nexus between clinical quality assurance activities performed in a medical setting, such as a hospital or clinic, and forensic activities performed in the setting of a potentially criminal event. The two activities and disciplines have infrequently been thought of as similar. However, both having patient safety as a common goal, it is argued that they are complementary. This presentation should stimulate discussion of this concept.

Safety is an inherent right within all healthcare facilities. Patients and their families expect that they will be cared for and perhaps even *cured*, without harm occurring as a result of being hospitalized. Even if there were some recognition that medical errors or accidents might occur, and that adverse medical outcomes are not outside the realm of possibility, the public has a right to expect that caregivers would not intentionally engage in acts of malfeasance or criminal behavior. Hospitals intending to reduce risks for patients must be willing to establish rigorous programs to oversee staff activities and to monitor clinical care routines as well as therapeutic responses. In addition, any suspicious behavior, adverse outcomes, or sentinel events must be thoroughly investigated in order that appropriate corrective actions be taken to prevent recurrences.

In 1988 Congress passed Public Law 100-322 that mandated the Veterans Affairs (VA) Office of Inspector General (OIG) oversee, monitor, and evaluate VA's clinical quality assurance programs. In

trending data from OIG quality assurance oversight activities, it was found that numerous issues with forensic implications were identified. This was an unexpected finding, because medical quality assurance is a clinical and peer-based activity, as opposed to an investigatory activity.

A retrospective review of clinical quality assurance oversight activities encompassing the period of May 1989 to May 2002 reviewed OIG efforts, activities, and products to identify those that had both quality assurance and forensic implications.

The findings revealed that quality assurance is primarily conceived and implemented by hospitals as an administrative and clinical activity. On a “small scale,” for example, a single hospital or ward, quality assurance is clearly a clinically oriented behavior as demonstrated by the manner by which such cases enter the quality assurance process (peer review, drug utilization studies, etc.) and the nature of cases that come to oversight attention. However, also found when assessed in the context of a vast healthcare network such as the Veterans Health Administration (VHA) of the Department of Veterans Affairs (DVA), forensic issues emerge prominently.

Forensic issues brought to oversight attention via clinical quality assurance processes fall into several major categories:

- Patient abuse
- Suicide
- Assault
- Homicide
- Medication related concerns including medication or delivery system tampering, improper medication administration, and grossly negligent medication errors
- Medical equipment and device tampering
- Problems with restraints
- Problems in search and rescue procedures for eloped patients

The implications of this finding are important. Since QA has traditionally been perceived in clinical and administrative terms, this recognition of the forensic aspects of QA oversight has been unreported, and not explicitly identified. However, recognition of this link may greatly facilitate patient safety activities. Likewise, these findings suggest the need for closer collaboration and cooperation between quality assurance specialists and forensic specialists. The term “forensic QA” is appropriate to apply to this overlap. “Traditional” QA activities such as the Morbidity and Mortality Conferences may also have important forensic value.

Finally, understanding this link between quality assurance and forensic medicine may also make caregivers more sensitive to the importance of preserving potential medical evidence for both quality assurance and jurisprudential purposes.

Conclusion: The link between forensic medicine and quality assurance should be recognized and explored further.

Medical Investigation, Quality Assurance, Patient Safety

D31 A Review of the Operations of the Center for International Forensic Assistance (CIFA)

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At this presentation, the participant will learn about CIFA which is an international effort aiming to make available independent forensic assistance at a short notice wherever that may be needed for humanitarian purposes. A brief review of some of CIFA's most recent missions will also be presented for the participants.

The Center for International Forensic Assistance (CIFA) is based at the University of Glasgow in Scotland, U.K., within the Department of

Forensic Medicine and Science. Established in 1839, it is one of the largest and oldest departments in Europe. The Center has continuously served the community and contributed to the development of forensic medical sciences. It has already been actively involved in the provision of international forensic expertise in a broad range of missions. These include investigations of war crimes, mass disasters, human rights abuses (including the identification of victims for humanitarian purposes), individual cases internationally, and assistance with training of experts abroad and development of their facilities.

The Center maintains a database of experts ready to deploy on a mission when this becomes necessary. Experts have access to the web domain (www.forensicassistance.org) where they may obtain all the latest information on missions. Ready to deploy in missions around the world, the Center has experts from almost 30 countries including the U.S., U.K., Mexico, Canada, Costa Rica, Argentina, Australia, Italy, Poland, Portugal, Greece, Turkey, Austria, New Zealand, Pakistan, South Africa, Denmark, Norway, and Malaysia.

Such forensic investigations have already taken place in several countries, including Bosnia-Herzegovina, Croatia, Kosovo, Georgia, Kazakhstan, Rwanda, Sierra Leone, Cambodia, Sri-Lanka, Cyprus, Chile, South Africa, El Salvador, Guatemala, Romania, Nepal, The Philippines, Italy, Germany, Greece, Saudi Arabia, United Arab Emirates, and Gibraltar.

The personnel associated with the Center comprises of Forensic Pathologists, DNA Experts, Forensic Toxicologists, Forensic Odontologists, Forensic Anthropologists, and Archaeologists, International Law Specialists, Psychiatrists, various technical experts, and others belonging in disciplines related to the forensic work. All of them are committed to achieving high standards of forensic expertise and academic excellence through participation in training courses as part of a continuing professional development program, assisting other countries to improve or establish their forensic capabilities, and participation in research projects as appropriate.

The overall role of the Center is to facilitate the planning and execution of the international forensic work and provide assistance to the humanitarian aspects involved in this field. The Center lends forensic assistance to the International Community by providing forensic science expertise to assist in the investigation of war crime atrocities, mass disasters, individual cases of a political nature and/or human rights abuses and other cases as appropriate.

CIFA formally interacts with other organizations and individuals both nationally and internationally to facilitate mission planning and execution. Moreover, an educational role is provided for the dissemination of knowledge through conferences, seminars, workshops, and other customized institutional, and individual training programs. Finally, the improvement or establishment of forensic capabilities in various countries is assisted and research and evaluating activities in all areas of forensic expertise and other related disciplines are carried out in accordance with the aims of the Center.

Our efforts also include the identification of humanitarian needs in relation to the execution and planning of missions and acting as liaison with other associated disciplines such as the Social Sciences and Mental Health. CIFA provides impartial forensic scientific assistance worldwide at any time.

Center for International Forensic Assistance, Humanitarian Missions, International Database

D32 Alcestis: A National Network for Mortality Data Collection and Bio-Terrorism and Injury Surveillance

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The goals of this presentation are to educate the forensic community of the existence of a bio-terrorism and injury surveillance program administered by the Center for Collaborative Research in Health Outcomes and Policy (CRHOP). Participants of the poster session will see the benefits of collecting data via the Internet, will realize potential research topics, and will learn about research currently underway from data collected by this initiative.

This poster will present an overview of Alcestis as well as the benefits that can be obtained by medical examiners, coroners, and death scene investigators, including preliminary findings of analysis conducted from data collected by Alcestis in Michigan.

Medical examiner and coroner investigations produce valuable information useful to health officials, the criminal justice system, and families of the deceased. Alcestis creates uniform standards and establishes data collection and reporting procedures for medical examiners and coroners at the state and county level nationally.

Alcestis bridges the gap between surveillance and research with the creation of an electronic system storing in-depth data on the circumstances and social factors surrounding fatal injuries and unexpected deaths. Hosted on the Internet, the database provides health professionals with a valuable tool for community health assessments, injury prevention efforts, organization of EMS services, and other statewide efforts.

With the continued expansion of Alcestis nationally, the value that states and researchers derive from the database will expand. This initiative will allow states to standardize and establish data collection procedures as well as make possible nationwide research opportunities that, heretofore, were unfeasible. The primary benefit to be obtained from Alcestis is its ability to serve as a tool for county, regional or state surveillance of bio-terrorism and injuries.

Alcestis will provide medical examiner/coroner offices a fully supported package that includes secure Internet access to the on-line database, paper data collection forms, and data analysis tools. Training, tech support and quality improvements will be on-going. Medical examiners and coroners benefit from *Alcestis* through quick and easy access to their mortality data, instant reports, and the ability to share data among counties and with other colleagues.

The system consists of three components: a death scene investigation report, an Internet-based database container for medical examiner data entry, and county profile pages connected to the database that automatically aggregate and chart the data for reporting. Samples of these components are provided in Appendix B. When compared with traditional medical examiner data collection and storage methods, Alcestis offers the following advantages:

- *Alcestis* staff conducts system maintenance and backups centrally.
- There is no need to install software on the user's machine or allocate hard-drive space for data storage.
- Users receive routine upgrades to the database as it is continuously improved.
- The system can be accessed at any time from any computer with Internet connectivity.
- If a person can "surf the web" he/she can use the system. There are no new programs to learn.
- Proven public/private key security features and encryption are in place to make submission of information secure.
- Additional products/services include a user manual, data dictionary, codebook, training materials, data integrity checks, and technical support.

The software is managed and accessible via the Internet; it is written in common programming languages, compatible with the majority of off-the-shelf products, scalable based on office size, and requires no hardware allocation by the end-users. Additional services

are provided that include a data collection form that mirrors the electronic database, an easy-to-read user manual explaining the system design and functionality, a codebook and data dictionary, and a staffed technical support hot line.

Currently, Alcestis is working with the CPSC, Kids-N-Cars, MIFACE, The Firearms Surveillance Initiative, and the CDC as well as research oriented ME/coroner offices in Pennsylvania, Florida, West Virginia, and California to establish initial memberships with ME/Coroner offices for Implementation of *Alcestis*.

Bio-Terrorism, Injury Surveillance, Data Collection

D33 Epidemiological Study of Alcohol Consumption in General Population of Dharan

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The goals of this research project are to study the epidemiology of alcohol consumption in general population of Dharan and to plan effective measures to control the menace of alcohol abuse in Nepal.

Of all the drugs which human beings have used and abused in the course of their checkered history, alcohol is almost certainly the oldest and also the most widely used because it is so easily produced.

Alcohol has always been used in Nepal. Alcoholic beverages are culturally accepted and social tolerance for alcohol use and alcohol dependence is quite high; therefore, alcohol has not been considered a drug for serious concern either by the Government or by any social organization. Alcohol could be the number one problem (drug) if one seriously considers the magnitude and extent of the problem it has created in Nepal. Alcoholic drinks in various forms have long been consumed in Nepal. Alcohol is necessary on most occasions among men, is relatively frequent, and is well tolerated by many communities. However, there is strong social disapproval of female drunkenness. It is not uncommon to see female alcoholics in the country especially in the hilly and mountainous regions.

A "Matwali" is a person who is allowed to drink alcoholic beverage by virtue of his birth. A high percentage of the Nepalese population belongs to this category and many of them take alcoholic beverages either on social occasions or on a regular basis. People who do not belong to this category are not supposed to consume alcoholic beverage even on social occasions. But there seems to be very steady rise in the number of people belonging to this category who consume alcoholic beverages.

People in Nepal generally believe that alcohol is remedy for cold, pain, physical tiredness, and so on. In fact, alcohol is extensively used for many ailments, especially in the rural areas. Most of the unskilled and semi-skilled workers in Nepal believe that they can function better if they take small amount of alcohol from time to time. Moreover, alcohol has become a status symbol for many people. Parties, get-togethers, or festivities are considered incomplete if alcoholic beverages are not served.

According to the 1991 figures from the Department of Excise, the sale of alcoholic beverages seems to be increasing rapidly. Since there is no export of alcoholic beverages from Nepal all beverages are sold and consumed within the country. If home production is taken into account, under-reporting of commercial production, liquor brought in form duty free shops and liquor imports, even more alcoholic beverage are consumed in Nepal. The number of distilleries and breweries is also increasing.

Even light drinking may adversely interact with other medication;

temporary heavier drinking can exacerbate most medical illness; and alcoholism can masquerade as many different medical disorder and psychiatric syndromes. Alcohol abuse is a generally acknowledged cause of, or to say the least, an important contributing factor to, accidents, homicides, and suicides.

Therefore, it is felt that the study of the overall prevalence of alcohol consumption, the vulnerable age groups, the ethnic distribution, the role of socio-economic factors, age, sex, and type of liquor shall help to find out the quantum and magnitude of the problem so that the government can plan effective measures to control the menace of alcohol abuse in Nepal.

Alcohol, Drug, Drinking

D34 Practical Applications of Forensic Botany

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The goals of this presentation are to illustrate to the forensic community some specific uses of botanical evidence and to highlight resources that are readily available.

Forensic botany is based upon the knowledge and techniques of plant science to legal matters, especially those related to crime. This presentation is based upon actual experiences with applications from three aspects of botany in criminal, especially homicide, investigations. These areas include Plant Anatomy, Plant Taxonomy, and Plant Ecology.

Plant Anatomy. Because of the indigestible nature of plant cell walls, they pass through the entire digestive system intact. Furthermore, many of the plants eaten (i.e., fruits, leaves, stems, roots) are composed of cells with unique cell wall features and/or particular combinations of cell types that make it possible to identify the source food plant from small pieces of plant material consisting of a number of cells. Occasionally, isolated cells may be useful. Specific plant food sources may often be identified after examining stomach, intestinal, or fecal samples. Vomit can also provide a rich source of plant tissues. The utilization of plant cell matter in the human digestive tract requires some special training, but the laboratory techniques are simple and employ accepted practices of identification of unknown samples by visual comparison with known samples using a compound microscope. Stomach contents or vomit may be used to reconstruct a victim's last meal and may be useful in determining time of death with respect to the last known meal a victim may have eaten. Two fecal samples may be examined and determined if they came from the same source. Unlike stomach contents, feces often are a unique mixture of several meals, and there are marked differences among unrelated samples with respect to frequency and identify of specific items. Fecal material on a suspect's clothing may link him/her to a crime scene. Plant material embedded in human tissues has also been identified. Photomicrographs depicting the distinct nature of these materials as well as information on processing of samples will be presented.

Plant Taxonomy. Beyond the identification of plants as specific drug sources, a second kind of botanical evidence in crime scene investigation comes from plant taxonomy. Specific plant materials associated with vehicles have been used to link suspects to a crime scene, to connect a suspect to a victim, and to verify that a body was transported from the original crime scene to where the body was found. Information on collection, preservation, and identification will be provided.

Plant Ecology. In the search for clandestine graves, ecological knowledge of patterns of plant succession is useful. Disturbance patterns of ground and vegetation over graves vary in known ways and are dependent upon time since burial, decomposition of the corpse, and regional climate among other factors. Knowledge of species that characterize specific habitats also may be useful in linking a suspect to a crime scene.

Resources. Virtually any college or university will have people trained in one or more of these botanical disciplines to aid in gathering evidence. Local experts are especially helpful for taxonomic and

ecological evaluations. Specific help with food plant identification from digestive tract samples may be provided.

Education. Presently there are no formal training programs and no board certification available for forensic botany. Advanced education in botany is essential (MA or PhD) with some training in crime scene investigation, evidence procedures, and courtroom testimony, as well as appropriate professional affiliation.

Summary. Many aspects of botanical knowledge are useful in detection and in courtroom testimony in criminal cases. Some witnesses may require specialized training to be received as experts in courts. Botanical evidence as described here calls for relatively inexpensive traditional scientific techniques to produce credible evidence.

Forensic Botany, Techniques, Education

D35 Community Bio-Surveillance: A Role For the Medical Examiner in Enhanced Public Health Surveillance

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The attendee will understand the role of a medical examiner in an enhanced community-wide bio-surveillance model.

Objective: Establishment and dissemination of real-time, multi-jurisdictional, low cost healthcare and medical examiner surveillance of six sentinel syndromes and unexplained/sudden deaths by the City of Milwaukee Health Department (MHD) to detect an event or trend signaling possible bioterrorist activity or natural disease outbreak during high profile public events in Milwaukee.

Background: In June-July of 2002, 1.2 million visitors visited Milwaukee for the Major League Baseball All Star Game, Greater Milwaukee Open golf tournament, Great Circus Parade and Summerfest. Enhanced disease surveillance was already operational and included: regional laboratory information¹, communicable disease reporting network², poison control and nurse hotlines, qualitative reporting of sale volumes for OTC³/prescription drugs by category, and reports of illness at select long-term care facilities. Timely statistics on syndromes suggestive of bioagent exposure were desired, but the MHD lacked staff resources and systems for on-site chart abstraction similar to that employed at the 2002 Salt Lake City or 2000 Atlanta Olympic games⁴. However, the MHD had developed strong relationships with local emergency departments (EDs) that had experience using the secure, EMSysTM website and with the county Medical Examiner (ME) through previous collaborations. EMSysTM had been successfully used for interactively linking county EDs with local public health (i.e., ED diversions, extreme heat alerts)⁵. The MHD believed this infrastructure could be used as a platform to collect voluntary syndromic reporting by EDs, mortality data from the medical examiner, and ultimately be linked with existing community surveillance to create a daily "surveillance dashboard" facilitating review before, during and after high profile public events.

Planning and Methods: Syndromic surveillance forms used by the Salt Lake County Health Department during the 2002 Winter Olympics were revised to create simple checklists and tally sheets where the presence or absence of six sentinel pre-defined syndromes could be recorded. ED managers agreed to attach the forms to all charts for completion during or after evaluation by medical personnel. Similar collection of syndromic data was arranged on a voluntary basis at select urgent care sites and primary care practices. ED staff were prompted daily by EMSysTM to report 24-hour counts of patients meeting syndrome criteria, as well as total patients seen. Patient identification was not reported, but every syndrome checklist would be stamped with the information and maintained at the clinical site in the event of follow-up investigation. In addition, the county medical examiner agreed to report daily counts of "unexplained, sudden or suspicious death with

fever,” and total reportable deaths. Decedent Investigative reports meeting the case definition were provided to MHD for follow-up. This information was transmitted via email and fax to the MHD each 24-hour period. Project reporting included the establishment of baseline levels and occurred over a four-week period lasting eight days after the conclusion of the final special event. Absolute syndrome counts and the proportion of syndrome cases to all patients seen were calculated daily and collated with other disease surveillance and posted on the secure and dedicated EMSystem™ website.

Results: Eight EDs, two community physicians, two urgent care clinics, one county medical examiner and one large retailer of OTC/prescription pharmaceuticals participated throughout the four-week-biosurveillance project. After some initial and minor inconsistencies in frequency and completeness of data, all sites routinely reported both syndromic case counts and overall site volumes to the MHD. The EDs reported a total of 314 cases meeting syndromic criteria out of 26706 patient encounters. In comparison, the community physicians and urgent care clinics reported a total of 214 cases meeting syndromic criteria (primarily pharyngitis associated with groups of patients seen from area youth camps and retreats) out of 2242 total encounters. The county medical examiner reported two cases of unexplained/sudden death during the four-week period that were reviewed and after further consultation found not to be unusual. No unexpected disease occurrences, clusters or other unusual surveillance data were observed during the biosurveillance project. The EMSystem™ website was also used during the pilot period to send e-mail/text pager alerts related to extreme heat conditions and the region’s first 2002 finding of avian West Nile Virus. Survey findings about participants’ experiences with the program will be evaluated and used in future modification of the model. Early on, staff identified problems with standardization of syndromic reports by clinicians and the completeness of case (numerator) as well as patient encounter (denominator) totals. The ability to develop this type of system required, but also strengthened, meaningful collaboration between public and private healthcare entities. The existence of a regional and familiar Internet-based link between EDs and public health (i.e., EMSystem™) greatly facilitated the ED surveillance effort.

Conclusion: Real-time syndromic surveillance by hospital EDs and other healthcare providers and routine sharing of data between other public health community partners such as the medical examiner, pharmacies, and poison control may reduce the lag between onset, recognition and response critical to effective control of man-made or natural epidemics. At very modest cost, the City of Milwaukee Health Department established and sustained a daily voluntary reporting system over a four-week period and created a “surveillance dashboard” using secure website communications provided by EMSystem™. While this pilot demonstrates that meaningful quantities of information may be collected and transmitted by health providers for finite periods, insufficient information is available to evaluate the sensitivity, specificity or predictive value of the syndromic surveillance tools used. However, it is believed that the model validates implementation of a biosurveillance system for a limited duration in preparation and as a backdrop to high profile public events. As such, the model underscores the importance and need for active surveillance as a component in preparation and response to public health emergencies.

¹ E*lab fax network links labs serving 35 hospital and 50 clinics.

² SurvNet County-wide Communicable Disease Surveillance Network facilitated by the City of Milwaukee. Excellence in Information Technology Award (1999) National Association of County and City Health Officers.

³ Over The Counter

⁴ Risk I and Stevens M. Analysis and reporting of data during the Olympics. 3rd National NEDSS Stakeholders Meeting, Atlanta, GA May 8-10, 2002. Heryford, A., Boodleman, L., “Public Health’s Winter

Games: Bioterrorism Surveillance in Wyoming”. Northwest Public Health, Spring/Summer, (2000): 16-17.

⁵ EMSSystem. Real-time web-based Diversion and Disaster Information Management. <http://www.emssystem.com>.

Public Health, Bio-Surveillance, Syndromic Surveillance

D36 Staging a Crime Scene: The Intentional Manipulation of the Scene to Divert Attention Away From the Killer

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This presentation will demonstrate the ability to determine the elements involved in staging a crime scene by the killer.

Test: The act of staging a crime scene is very rare. It occurs in less than two-tenths of one percent of all murder scenes. “Staging” is the purposeful alteration of the crime scene. It consists of manipulating the elements of the scene to make it appear to be something it is not. Staging has been widely written on and has been accepted by the courts as a definable characteristic of a crime scene. The basis of staging is to direct an investigation away from the person who stages the crime scene, because the person feels he or she would be a likely target of the investigation. Staging may be as simple as the owner of a car setting his car on fire to collect insurance and reporting his car as stolen. In another example, in 1974 convicted murderer Tony Fernandez bludgeoned his wife to death. To cover up the murder and prevent the notice of a crime, he placed her body behind the steering wheel of their motor home and pushed it over an embankment, hoping to make the murder look like an accident to redirect the investigation. Another motivation for preventing detection by staging is altering a murder scene to look like a burglary or robbery gone awry. Staging a murder scene requires the killer to spend time after the victim’s death arranging things in a certain way. The person who stages a crime scene does so based upon experiences and perceptions of how certain crime scenes should look. These actions go beyond the actions necessary to commit a murder.

In the murder of Lisa Carlson, the crime scene was staged. The purpose of the staging was to direct suspicion away from the identity of the perpetrator by making a murder look like a “burglary and/or rape gone bad.” A multitude of factors describes the killer’s efforts to stage this murder scene. First, the most egregious staging factor is the discontinuity between the actual cause of death and staged crime scene. The two are not reconcilable. For three gunshot wounds, one to the body and two to the head, without any percussive violence, is albeit a conceptual motive of power, control and problem resolution. Conversely, the victim is staged in a setting that pretends to portray a sex murder through the use of sexual paraphernalia, sex videos, disarrayed pants, and covered genitalia to sate the primary needs. In this case, there is no evidence of percussive touching of the victim, until after the killing, the perpetrator manipulated the body for staging of a greater and different type of murder. Again, by the lack of antemortem, perimortem, and/or postmortem percussive activity on the body of the victim, the perpetrator inadvertently exposed the fraudulent attempt to disguise the original simple motive and executed plan. Notwithstanding, it should be clear that a wandering psychopathic sex-killer would not be concerned with staging and/or focusing the law enforcement attention elsewhere. In fact, the manner of death in this case is clearly an issue of ending the victim’s power and control. Of course, this would only be true for those who she had the ability to resist.

Second, Lisa Carlson was not shot in the position she was found. She had been moved to that position after being shot. Typically, murder victims are discovered in the position where the death producing injuries occur, and their killers are unconcerned about how the victims are found. The victim was moved to her final resting place. The victim has been pulled back to her position on the couch. The killer grabbed the victim's sweater causing it to bunch and enabling the killer to pull the victim to her place on the couch. The victim could not have caused the bunching to occur.

Third, after the shooting, the victim's pants were pulled down. This occurred by someone standing at the victim's feet, pulling on the pants, thus causing the pants to turn inside out. There is no credible evidence that shows the victim could have pulled her own pants down in that position.

Fourth, blood spatter evidence demonstrates that the victim was fixed in place after the shooting and then moved. In order for the hair swipe to occur on the couch, the victim's hair must accumulate blood for a period of time. After this, then the blood swipe from the hair could occur. Additionally, the swiping blood pattern on the victim's inner arm is evidence that her right arm came in contact with her hair while being pulled back to her final resting place.

Fifth, the blood transfer evidence on the sexual device indicates that the device was placed there after the shooting. There are sweeping blood transfer stains present on the cord and device that occurred while they were being positioned. Also, the device was placed in her left hand, but she is right-handed.

Sixth, the blanket found on top of the victim was placed there after she was shot and the transfer stains had occurred on the sexual device and cord.

The number of blood stains on and around the victim contrasts with the neatness in the application of the placement of the victim, sexual device, and blanket. The body was moved from the position that it was in prior to the blood spatter patterns to the position it was found at discovery.

Seventh, the ransacking of the chest of drawers in the victim's bedroom was a solitary event, not consistent with ransacking done in the normal burglary case. It was not consistent since there was no other ransacking done in other rooms with valuables obviously present. Also, there was no apparent loss of any valuable items. Traditionally, televisions, video recorders, and computer equipment would have been moved or removed. But these items appeared untouched and were not disturbed.

Additionally, more inconsistencies in the ransacking were present. The drawers were removed from the chest of drawers. One drawer was not overturned and another blocked the removal of a drawer from the second and third level of the chest of drawers. The blocking drawer would have been thrown out of the way by a curious burglar. The contents of these drawers were not gone through in a typical manner. One drawer was just pulled out and set on top of other contents, but not overturned. The bottom drawers did not appear to ever have been opened. In burglary crimes, when there is rifling through drawers, contents are usually disturbed, even dumped out or strewn about. But in this case, there was no noticeable disturbance of the contents of one drawer that was removed from the chest. Only drawers containing items belonging to Lisa Carlson were rifled through in the house.

Finally, the telephone answering tape was tampered with. There was an expectation there would be a sequence of messages that were left on the tape. It was detected that two messages overlap, and this could only occur if someone tampered with the tape recording.

A killer's method of operation contains those actions that are necessary to commit a murder. Whatever this killer did beyond committing the murder, such as moving the victim from the place she was shot to her final resting place, placing the on/off switch to the electronic dildo in her wrong hand, placing a blanket over her lower torso after smearing blood on items and clothing under the blanket,

leaving drawers open with atypical burglary and theft disturbance, manipulating the tape on the victim's telephone messaging machine, and either not removing anything or removing only small items with other typical burglary loot in plain sight ready for the taking, was the killer(s) highly personalized effort to stage the scene.

Staging, Profiling, Modus Operandi

D37 Medico-Legal Aspects of Road Traffic Accident and Insurance in Nepal

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The goals of this paper are to present to the community and the government of Nepal a need to institute proper road safety measures and to promulgate appropriate law and insurance policies so that in the future the country and society may lessen human suffering and decrease the negative economic influence of road traffic accidents.

Nepal is a land-locked country nestled in the midst of the world's highest mountains, strategically situated between the vast plains of the Indian subcontinent to the south, east, west, and the high Tibetan Plateau of China to the north. The total land area is 147,181 square kilometers. The population is estimated at about 22 million; about 90% are Hindus, and more than 90% live in rural areas.

Topographically, the country can be divided into three well-defined physical/geographical belts running from east to west. The terrain (plane land) contains 23% of the land area and 45% of the population; it is 200-1,000 feet above sea level. The hills contain 42% of the land area and 47% of the population; this area is 1,000-16,000 feet above sea level. The Mountain covering 35% of the land area and the remaining 8% of the population lies above 16,000 feet.

Administratively, the country is divided into five development regions and 75 districts. The economy of Nepal depends heavily on agriculture, which provides employment of more than 91% of the economically active population and account for about 60% of export earnings. Tourism plays an active part in foreign exchange earnings. Approximately 25% of tourists come from India, 38% from Western Europe and 37% from the rest of the world. Many Nepalese also have relatives in adjacent states of India and both sides move freely across the border.

The total roads in Nepal are 13,223 km; the national high way is 2,905 km; major feeder roads, 1,656 km; minor feeder roads, 179 km; district roads, 6,615 km; and, urban roads, 1,868 km. Of the total roads, 4,073 km are blacktopped; 3,476 km, graveled; and, 5,674 km are dirt roads. Most of the roads do not have proper traffic signals and poor speed breakers and humps further contribute to accidents. There are hardly any motor-able roads in many hilly and mountainous areas to the north and so people have to walk miles through the narrow passage for days where hardly two persons may encounter one another. Some headquarters do not have roads and access is only possible by air.

Public insurance is not mandatory in Nepal and therefore hardly 2% of the population is insured. The reasons are poverty, illiteracy, and ignorance of the people and lack of proper planning and management by the government because of rivalry between the political parties, mid-term multiple election, and economic failure leading to instability of the government. Similarly, not all vehicles have been insured and only recently has insurance become mandatory for all four-wheel vehicles. Most of the two-wheel and four-wheel vehicles still remain to be insured.

Beside Ethiopia, Nigeria, and Ghana, Nepal has the dubious

distinction of having one of the highest accident rates in the world. It is estimated that about 1,400-1,500 persons die and 4,000 are injured annually where approximately 4,000 vehicles are involved. Moreover, thousands of animals also die and many get injured because animals, like cows, buffaloes, horses, donkeys, bulls, oxen, goats, pigs, dogs, cats, and other domestic animals, also use the same roads and many times vehicles run out of control and injure or kill people while trying to save animals. Most of the motorcyclists encounter such a problem and meet an accident.

Disproportionately high percentages of these annual deaths, injuries, and permanent disabilities are borne by the citizens of developing nations. Statistics show that, while the people of developing countries own only 32% of the world's vehicles, they account for 75% of the annual accident fatalities.

Commencing from the 1970s, road safety improvements in North America, Europe, Japan, Australia, and New Zealand resulted in significant reductions in the rates of motor vehicle fatalities. Control of drunk driving, the mandatory use of child-restraint devices and seat belts, and improvements in passive protection, such as airbags, have further reduced the number of deaths and the severity of injury. The situation is quite different, though, in the developing world where a growing number of accidents on the roads have caused the problem to reach epidemic proportions. In the highly motorized countries, the occupants of cars are the primary victims of traffic accidents. In the developing newly motorizing countries, vulnerable road users such as pedestrians, bicyclists, motorcyclists, and scooter riders, and passengers on public transportation sustain the majority of deaths and injuries. They travel together on the same roads with buses, trucks, and cars, in a chaotic traffic stream. Mismatched collisions between the unprotected humans and the heavy vehicles cause serious injury or more frequently death, even at lower speeds. Head-on collisions between vehicles are not uncommon because the traffic moves both ways on the same road in Nepal and many other countries in Asia. Moreover, a significant number of heavy and lightweight vehicles are 30 to 40 years old and are still cruising the road ignoring air pollution, sound pollution, as well as mechanical failure, all frequently leading to catastrophes.

Unlike the developed countries where cars are the predominant mode of private transportation, in the newly motorizing countries, more affordable motorcycles and scooters are being purchased and are joining the unregulated traffic stream in large numbers. The resulting explosive 16-18% vehicle growth rate in many Asian countries will lead to doubling of the fleet in five years and a trebling in eight years, causing even more severe problems. Not separating the various road users, sparse traffic safety laws, inadequate police enforcement, absence of pre-hospital emergency care, and limited resources for acute hospital and rehabilitative care are added factors explaining the frequency of accidents and their devastating consequences.

Road Traffic, Accident, Insurance

D38 A Study of Pulmonary Function in Workers at Flour Mills in Duhabi, Nepal

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The goal of this research project was to create awareness among the workers at flour mills about the health hazards and consequences of smoking so that the workers as well as government, in a developing country like Nepal, should take appropriate measures to prevent respiratory health hazards due to flour dust pollution.

Exposed to flour dust, 52 male workers were evaluated for pulmonary function, respiratory symptoms and smoking habits.

The study showed a significant reduction in FVC, FEV1, PEFR, FEF 25-75%, and MVV. Flourmill workers who smoked showed further significant deterioration of lung function parameters when compared to non-smokers. From this study it can be concluded that those exposed to flour dust contract a combined type of spirometric deficit revealing obstructive disease and smokers working in such an environment are prone to develop further reduction in pulmonary function parameters.

Pulmonary Function, Smoking, Flour Dust Exposure

D39 No Crime, No Warrant, No Charge, No Arrest, But Excessive Force

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The goals of this presentation are to demonstrate the forensic evaluation of radiographs with reference to other evidence in determination of causation of injury.

This presentation follows the step-by-step reconstruction of such a case, copiously illustrated.

A 68-year-old male resident of a Mid-Western city suffered from progressive dementia or Alzheimer's disease. He previously had survived a cancer necessitating total removal of his left lung. Nevertheless, he was able to feed and dress himself, bathe and shave, and otherwise take care of his personal hygiene. He was able to converse, watch television, and go for walks (although he sometimes became confused or lost).

On a fall evening this elderly man walked several blocks to a neighborhood convenience store. There his activities and the subsequent actions of others were recorded by a surveillance video camera at 3 frames-per-second. He was seen to wander about the store a bit but mostly just stood around and watched other people. He didn't appear to speak to anyone or make a purchase. Apparently, after several minutes, one of the employees of the convenience store grew tired of having him around and called the city police.

Abruptly, on the surveillance tape, one sees a large officer approach the elderly man and, without warning, grasps him from behind. With arms locked around the old man's chest, the police officer lifts him off his feet, swings him around to the right, and then body-slams him to the floor. The old man lands on his right front and side with the full weight of the officer on top of him – a classic "take-down."

The officer and his patrol partner lifted the handcuffed victim to his feet and escorted him out to the patrol car where they had to help him into the back seat. The old man couldn't lift his legs into the vehicle and complained of his right shoulder. Although bleeding, he was offered no medical assistance.

The other patrolman recognized the victim, and he was driven to his home where he was assisted through a side door down three steps into a "club" basement and placed on a couch. His wife was told that he had "fallen."

After eating and drinking sparingly the old man fell asleep on the couch. Several hours later the wife found him on the floor in front of the couch, incoherent, incontinent, and short of breath. He was taken by ambulance to the hospital.

Multiple examinations revealed acute fractures of the right clavicle, the right second, third, fifth, sixth, seventh, and ninth ribs (some of them in two places), the right innominate bone, and the left transverse process of the first lumbar vertebra. A right-sided pneumothorax (undoubtedly caused by the rib-fractures) partially collapsed his only lung, thus compromising his respiratory capacity. His oxygen saturation values documented hypoxias. Finally, CT revealed a contusion and hematoma in the left lobe of his liver.

After extensive treatment the victim was discharged but was never able to go home again, being unable to care for himself, incontinent of bowel and bladder, and unable to walk or speak coherently. He has required additional hospitalizations for aggressive behavior and recurrent infections.

As a result of the above events and its sequelae, multiple complaints were entered against the police officer and the city. These charges were subsequently settled in favor of the plaintiff.

Excessive Force, Fourth Amendment Rights, Battery

D40 The Greyhounds and Me: Stories of a Forensic Nurse

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The goals of this presentation are (1) to examine some of the medico-legal issues that are present at a greyhound park and the necessity of proper nursing procedures and documentation to safeguard the corporation from civil and criminal issues, and (2) to recognize that the forensic nurse can capably carry out these functions.

The forensic nurse deals with clients and their significant others whose nursing problems bring them into actual or potential contact with the legal system. Among these clients are victims of interpersonal abuse and violence, victims of trauma, victims of drug abuse and misuse, those with undiagnosed health problems, those who fail to comply with their health care regimens, those involved in vehicular accidents, environmental hazards, and cases of sexual assault.

The following presentation represents a Greyhound racing park in New England, according to the State Pari-Mutuel Commission, where a registered nurse is required to be present whenever live racing occurs. A well-delineated job description does not exist for these nurses. But the nurse is given a well-equipped first-aid station that is located next to the security office and carries a walkie-talkie at all times. The site also hosts a well-known restaurant, bar stands, snack stands, and a banquet facility for hire.

Patron accidents and health issues as well as employee accidents or health problems are triaged, treated or referred to an Emergency Department when indicated. It is the duty of the nurse to collect evidence, document accident scenes, preserve evidence, and or institute what quality assurance measures are required to prevent further risk management for the corporation. This requires interfacing with administration, security, maintenance, and various liability carriers for patron liability, as well as Workman's Compensation. In fact, if proper reporting of Workman's Compensation cases is not made within 5 days the track owner is subject to fines.

It is sometimes difficult to convince non-medical personnel that "handing out an aspirin or giving someone Alka-Seltzer" may not be consistent with prudent medical practice in light of today's knowledge of adverse interactions. The bartender cannot be expected to discern which patron is on anticoagulant therapy or is subject to flash pulmonary edema, and administration officials must be convinced of that when they listen to the nurses' explanation of what O-T-C medications should or should not be available. One solution might be to shift the responsibility to the patron via the use of a coin-operated self-dispensing medication machine.

Similar to other tracks, heat exhaustion and collapse are common during the summer months with 90+ F. heat and 80%+ humidity. The differential diagnosis between adverse effects of environmental conditions and the patients' personal medical profile is a frequently encountered challenge, especially with the preponderance of Senior citizens frequenting the track. Assurance that the treated patron makes

it safely home is another potential liability for the nurse and corporation.

Although altercations between patrons are infrequent, occasionally the local law enforcement officials need to be summoned; evidentiary data and documentation and photo documentation are critical to obtain at the time of the occasion. Preservation of this information is paramount for possible protection from possible legal action at a subsequent date.

The nurse who works in the first aid station must have not only emergency nursing care experience which includes CPR, automatic defibrillator knowledge, and trauma nursing knowledge but also knowledge of current medications, their interactions, and adverse effects. At times the nurse performs as occupational health nurse. But at all times the nurse must have a sound knowledge of evidentiary recognition, collection, and preservation, and a sound understanding of proper medicolegal documentation. Only in this manner can the nurse help to safeguard the employer from unwarranted liability.

Forensic Nursing, Sports Track Medical Liabilities, Vendor's Considerations for First-Aid Care

D41 STR Database Technology Improvements— Storage, Retrieval, Matching, and Reporting

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Upon completion of this course, participants will be given an overview of the software technology demonstrating the ability to warehouse, manipulate, search, and report STR data using "Off the Shelf" Personal Computers.

STR Technology does not have to be expensive.

It is estimated that up to 40,000 individuals are still missing from the armed conflict in the former Yugoslavia during the 1990s. One of the primary missions of the International Commission on Missing Persons' (ICMP) is to help provide closure to families by aiding in identifying their missing loved ones. Various groups within the Forensic Sciences Program are producing tremendous amounts of data and a need for some specific technology to manage this data is crucial. This is especially true within ICMP's large-scale DNA testing program that produces gigabytes of data every month.

Beginning in May of 2001, the first 16 loci STR profile from a blood sample was obtained and, over the course of the next ten months, the relatively low level of data produced from minimal throughput of samples was easily stored and managed using "Off the Shelf" spreadsheet software. As methodologies and the scientific expertise improved, throughput increased. These improvements aided in transforming the ICMP's DNA laboratories into a high throughput DNA processing system in which the number of bone and blood samples being tested on a monthly basis increased from 100 and 200 to 500 and 3,500, respectively, from February to March of 2002. This increase in data quantity and the resulting need for the management of such data meant that spreadsheet technology would no longer be efficient for the task at hand. The technology created at ICMP allows STR data to be stored in either central or local locations and allows access to the data only by those with appropriate logon credentials. This technology has been dubbed "ICMP-IWH." (International Commission on Missing Persons Information Ware House). In order to access data from ICMP-IWH software, the user must first successfully log into the system. While the ICMP currently uses a 16-plex in obtaining the majority of its STR data, the ICMP-IWH system is adaptable to meet varying needs. The potential for future increases in the number of loci being used has been dealt with by allowing up to 24 loci per sample to be entered into the system, along with the corresponding allowable values for those loci. The order in which this information is displayed, edited, and reported is

also configurable. The ICMP-IWH has two ways of entering data into the database: either by manual entry or computer downloads. During manual entry, if a loci value is "Out of Range" the operator will be notified and can choose to accept or reject that particular sample. Importing STR data needs to meet certain criteria. The file must be comma or tab delimited with sample ID and STR data. In order to insure that the correct loci value is imported to its corresponding location in the database, the import file must have a "header record," i.e., first row of data, sample ID, D3S1358, THO1, D21S11, etc. The import engine does not require the import file to have any particular order for the columns of data, but they must be consistent in arrangement for that one file. Multiple sample categories are supported, i.e., staff, blood, bone, etc. The STR matching component of this software allows the operator to choose what sample categories to compare against each other, or an individual sample to a group. There are settings to adjust the number of minimum required loci or maximum excluded loci in either a half-band or full-band sharing mode. The software will provide the operator with the included and excluded loci "Hits" on any matching report. Statistical calculations may be performed on all data or individual groups using allele frequencies from different populations as necessary. This software ICMP-IWH runs the windows 32 bit operating systems. It has been tested on Windows95, Windows98, Windows98SE, Windows NT4.0 (sp5, sp6a), Windows2000 (sp1), and Windows XP and well as on Dell, AST, Acer and component-assembled computers. Minimum configurations that have been tested are PII-233Mhz with 32Mb ram and 4Gb hard drive. This software has also been tested on an Acer PIII 1Ghz (X2) SMP with 1Gb ram and 30Gb SCSI hard drives.

The development of a centralized computer system that receives all DNA data, a corresponding DNA matching program, a LIMS for the DNA system, as well as a universal bar coding system for all four of ICMP's DNA laboratories has been successfully implemented. These combined and integrated computer capabilities are an essential component to ICMP's DNA laboratory system and permit the ICMP to properly manage the gigabits of data that are produced each week and are critical when dealing with a system that produces an average of several hundred DNA match reports per month.

DNA, STR, Database

D42 Managing a Forensic Biology Laboratory in the 21st Century

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The goal of this presentation is to provide the participant with a range of strategies that may be employed by the managers of a forensic biology laboratory to ensure that services are delivered effectively and efficiently while addressing a myriad of demands and competing pressures.

Synopsis: In common with many forensic science labs, the CFS has faced a number of challenges during the last decade of the 20th century. These challenges have been multifaceted and have ranged from scientific, to legal, to fiscal.

The objectives of the presentation are to describe the various issues that have impacted the Centre of Forensic Sciences (CFS) Biology Section over the past decade and to demonstrate a more business-oriented approach to the delivery of scientific services.

Pressures: In the 1990s the effectiveness of the laboratory was addressed in judicial reviews of two different homicide investigations. The main elements of the two reports may be addressed in terms of quantity and efficiency of service delivery (Campbell report) and quality of service delivery (Kaufman report). However, both reports identified

the need for additional resources.

Both reports included a number of recommendations that impacted the laboratory, some of the key issues being:

- Turnaround times
- Co-ordination of scientists and police
- Objectivity and independence
- Report writing and court testimony
- Training
- Quality Assurance
- Appropriate resources

The issues highlighted in these reports were further compounded by the increasing demands for service that resulted from an increasing awareness on the part of police services, the courts, and the general public of the potential for forensic biology to aid in the investigation of crime

The ability of the CFS Biology Section to participate in and contribute to the investigative process was further expanded when the Canadian National DNA Data Bank became operational in June 2000. This again placed additional demands on services both in terms of volume and efficiency.

Resources: In addressing these pressures and in recognition of the potential for forensic biology to be a cost effective component in police investigations, the Government of Ontario provided funding for a new DNA laboratory, an increase in the number of staff from 36 in 1995 to 72 in 2002, and for an increase in equipment.

The challenge for laboratory management is to ensure the effective utilization of additional resources to be able to increase the capacity of the laboratory in as short a period of time as possible.

Strategies: Through a process of intra lab consultations with staff, a model for the reorganization of laboratory staffing has been developed. The model included an expansion of the management group and a greater emphasis on the utilization of non-court going scientists (technologists). The following staffing ratios were devised: one manager for each group of 10-15 scientific staff, and, one screening technologist and one DNA technologist to assist each pair of court going reporting scientists. Technologists carrying out DNA analysis were deployed in a DNA Unit dedicated to the analysis of samples submitted by reporting scientists.

In addressing issues of efficiency and quality, the ability to recruit the appropriate scientists and technologists was an important first step in the evolution of the laboratory. The CFS developed a behavioral competency model for the positions of scientist and technologist. These models provided to the authors a description of the behavioral competencies required of an excellent forensic scientist and were incorporated into recruitment competitions.

In order for new staff to be trained efficiently and effectively, so as to become operational as quickly as possible, a modular approach was adopted. Managers responsible for training developed programs that incorporated lectures, practical written and oral tests, proficiency tests, and mock court exercises all delivered according to set milestones and all within the framework of mentor relationships. These programs ensured that staff members were trained according to the following timelines:

Reporting Scientists	6-9 months
DNA Technologists	3-4 months
Screening Technologists	6-8 weeks

Issues concerning clarity of information provided to clients were addressed by changing the formats and contents of reports. Standard formats for CFS reports now include:

1. Purpose statement
2. Tests conducted
3. Results
4. Conclusions
5. Information about the case scientist and other staff who assisted in the examination

6. Sample consumption information
7. Continuity
8. Information concerning the analysis written for the benefit of the client.

In responding to client requests for a more timely provision of information, the approach in large case submissions was changed. In place of a single large report provided on completion of the examination of all items submitted during the course of an investigation, multiple reports detailing results priority batches are now issued.

A number of initiatives have been implemented in order to be able to define services to clients and to be able to respond proactively to demands. As part of a province-wide major case management program, police follow a set procedure. In order to take advantage of this, a process has been implemented whereby the investigating team meets with a consultant forensic biologist prior to the submission of a case. The consulting scientist directs the items to be submitted and the examinations to be conducted. This avoids the inefficiency of items being submitted but not examined and improves the flow of information between scientists and investigators. This process also facilitates a service contract that includes the number of items to be examined, the specific tests to be performed, and a timeline for the provision of results.

The advent of the DNA databank facilitates the use of DNA analysis as an investigative tool to allow the identification of suspects. In order to maximize this service, a number of programs in partnership with police services have been developed. These include the development of a formal process for the rapid dissemination of information to investigators when a "hit" to the databank is registered, a co-coordinated approach to the examination of DNA evidence in "cold cases," and the development of a service for the examination of evidence from break and enter cases. These services have been designed to facilitate the processing of cases in a timely fashion and have resulted in 147 investigations aided for a total of 1800 profiles entered onto the Crime Scene Index.

The number of samples being processed by technologists in the DNA unit varies between 600-800 per month. Through process review and change, the time required for analysis of a sample from 16 to 8 calendar days has been produced. The current process employs a production line approach that will in future be amenable to the incorporation of further automation.

Ongoing initiatives include process review to maximize the efficiency of item examination, and a Research & Development program that is process driven.

Summary: By employing a variety of different strategies, an increasing range of services to clients has been delivered while continuing to improve turnaround times and quality of the science. This has resulted in increased satisfaction levels on the part of the stakeholders and an improvement in the contribution that the laboratory makes to public safety in the province of Ontario.

Laboratory Management, Service, Resource

D43 Analysis of Ignitable Liquids in Fire Debris With Comprehensive Two-Dimensional Gas Chromatography-Mass Spectrometry (GCxGC/MS)

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The goals of this presentation are to discuss a new analytical technique, comprehensive two-dimensional gas chromatography-mass spectrometry (GCxGC/MS), for the forensic analysis of fire debris samples.

Comprehensive two-dimensional gas chromatography (GCxGC) is a new analytical technique with a demonstrated capability to separate and identify ignitable liquid compounds in complex fire debris samples. The increased separation capability of GCxGC represents a significant analytical advantage over traditional gas chromatography (GC) and gas chromatography-mass spectrometry (GC/MS) methods for fire debris samples containing abundant pyrolysates. In traditional GC analysis, chromatograms of the fire debris extract are used as a fingerprint to determine if a particular ignitable liquid is present. However, the determination is often impossible if an abundant pyrolysate background obscures the chromatogram. GC/MS methods improve detection because extracted ion chromatograms may be used to isolate specific ignitable liquid compounds like alkylbenzenes. The enhanced chromatographic separation achieved with the new analytical technique of comprehensive two-dimensional gas chromatography and the unambiguous identification provided by mass spectrometric detection permit the rapid detection and identification of the full range on chemical compounds present in ignitable liquids.

GCxGC uses two different chromatography columns coupled serially by a modulator to produce a volatility-by-polarity separation and distribute compound peaks across a two-dimensional retention time plane. The two-dimensional separation produces hundreds- to thousands of resolved peaks, a significant improvement over traditional GC separations. The two-dimensional separation yields a two-dimensional image that is well suited for fingerprinting. In addition, the grouping or ordering of the peaks in the GCxGC chromatogram facilitates the identification of specific compounds unique to ignitable liquids against a complex chemical background of fire debris pyrolysates. When coupled with a mass spectrometer detector, the GCxGC/MS method produces a single-component, interference-free mass spectrum for each resolved peak that leads to accurate matching with mass spectral libraries.

GCxGC/MS methods were used to produce a library of chromatograms for different petroleum-based ignitable liquids as well as chromatograms of pyrolysates for common fire debris materials. GCxGC/MS chromatogram images were used to rapidly detect and classify ignitable liquids in fire debris samples.

Arson Analysis, Fire Debris, Analytical Chemistry

D1 Gone But Not Forgotten! AAFS Members Solve a Mystery!

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The goals of this research project are to understand the importance of 1) utilizing the team approach in focusing an investigation, 2) developing an investigative strategy, 3) conducting a thorough crime scene analysis, and 4) communicating between agencies.

On 03-26-1996, a train comprised of Tropicana Juice Company boxcars arrived in Jersey City, New Jersey from Florida. The temperature inside the boxcars had been maintained at 24 degrees throughout the trip. As each boxcar was unloaded, the refrigeration unit was turned off. The cars were unloaded between 0900 and 1200 hours. At the conclusion of the unloading process, the door to each boxcar was closed and marked with an orange plastic tie. The ties were used to indicate that the boxcars were empty, not as a means to prevent entry into the boxcars. The train remained on the track in an open yard until the scheduled departure at 1730 hours on the same date. The train made eleven scheduled stops while enroute to Florida. The train arrived at the Tropicana Dole Plant in Manatee County, Florida on 03-30-1996.

A Tropicana security officer noticed that the door to one of the boxcars was not sealed on 04-02-1996. Upon further inspection, he observed a bed sheet inside that had been tied into a bundle. The sheet contained the deceased body of a young black female. The victim was fully dressed in multiple layers of clothing, suggesting that she had been killed in a cold climate. Electrical cord and twine held her body in a position with her knees drawn up, and her hands and feet crossed. A metal chain was loosely secured around the victim's left ankle with a small padlock. A plastic bag and a pillowcase had been placed over her head. The cause of death was reported as possible asphyxia. Adhesive tape residue was noted on her hands, wrists, neck and face.

In 1996, the Medical Examiner estimated the victim's age at 17 to 24. In 1998, her body was exhumed and osteological and dental examinations were conducted by Dr. Murray Marks at the University of Tennessee. Dr. Marks estimated the victim's age between 14 and 16.

Numerous photographs were taken of the victim and her clothing. A police artist provided a sketch of the victim for distribution to the media. The victim remained unidentified, in spite of numerous calls to law enforcement agencies along the route the train followed from New Jersey to Florida.

With the permission of the investigating agency, Gregory Dickinson DDS presented the case information at BYOS at the 2000 AAFS meeting in Reno. Dr. Dickinson and SA Dayle Hinman teamed up to take on the task of identifying the youth. When the police investigation was suspended following the arrest of serial murderer Recindez-Rameriz, (AKA: the Railroad Killer) the AAFS team continued to press on. Using resources from the FBI and the Missing Children Information Clearing House, a missing teen from Pennsylvania became the focus of the case.

On 07-10-2001, the unidentified victim that had been buried in grave #62 in Palmetto, Florida was exhumed again and positively identified by a comparison of her dental records. She was laid to rest for the last time, in her hometown of Philadelphia. Her grave is marked with a headstone that bears her name – Latanya Reese. She was only 15 years old.

Odontology, Anthropology, Profiling

D2 A Signature Analysis of the Eight Whitechapel Murders Attributed to Jack the Ripper in 1888

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The goal of this research project is to understand the procedures involved in linking murder cases through *modus operandi* and signature.

In 1888, the now world-famous series of prostitute murders took place in the East End of London in an area called Whitechapel. By the fall of that year, a terrifying nickname had appeared in the popular press: Jack the Ripper. To this day the identity of the Ripper remains a mystery, yet public interest in these cases has never waned in the search for this Victorian serial killer. It has been documented as a historical true crime that has become entwined with so much myth that reality has all but disappeared.

In recent years, many old unsolved crimes have been resolved through the advances of forensic science. The automated fingerprint identification system and DNA technology have brought about the truth in many unsolved murders and rapes. There remains no evidence that would make these technologies useful in the Jack the Ripper cases. There is one advancement that has yet to be employed with the existing facts and evidence from the Whitechapel murders, that is, linking cases through *modus operandi* and signature analysis. Much has been written linking Jack the Ripper to all of the Whitechapel murders. The investigators at the time questioned this, but the myths portrayed in books and movies have made the extent of the Whitechapel murders all encompassing to include every Whitechapel murder at the time.

Linking cases by MO and Signature has proven important in the prosecutions of serial killers, such as Steven Pennell in Delaware, Cleophis Prince in California, Nathaniel Code in Louisiana, and George Russell and Robert Parker in Washington State. The signature of a killer is the actions a killer must do, over and above what it takes to commit the murder, for each and every murder that the killer commits.

For purposes of this submission, the facts known about each of the Whitechapel murders will be identified that pertain to the elements of the killer's *modus operandi* and presented to the participants. Then, the particulars of the killer's signature are revealed for each murder and only those murders linked to each other will be identified through this recent process of identifying the killer's signature.

The examination revealed that the killer's *modus operandi* remained fairly consistent throughout the five canonical murders attributed to Jack the Ripper. He attacked white female prostitutes in their 40's in a cluster of victims within a short distance of each other. The first four victims, Mary Nichols, Annie Chapman, Elizabeth Stride, and Catharine Eddowes, were killed and found outdoors in the Whitechapel area; then he changed his MO by killing and leaving the fifth victim Mary Kelly, indoors, still within blocks of the others in Whitechapel. By choosing to murder Kelly indoors, the killer demonstrated that he was an experienced nighttime (Cat) burglar and stalker, as he attacked all his victims in the early morning hours when dawn was approaching.

These victims were not victims of chance, but victims of choice. They were stalked. As Ted Bundy once stated, "the victim does not know the killer, but the killer knows the victim." The killer had to know who his victims were because they had to match his preferred victim type, penniless and needy prostitutes in their mid 40's. And most of all, he had to have knowledge, at least for the time that he spotted them, that the victims were alone and were not being followed.

Despite minor changes in the killer's *modus operandi*, his psychological imprint, or signature, was clearly detectable. The signature analysis will reveal that each victim was posed in a sexually degrading

position, intentionally left that way so the discovery of the bodies would startle the people who found them. They were not concealed or hidden away, but placed in locations where they would be easily discovered. The placing of victims on their backs, grotesquely laid out with their throats cut and viscera exposed or missing, reflect the cruel reality of the killer, his total mastery over their bodies. The pleasure for the killer was demonstrating each victim's vulnerability. Additionally, there was a progression in violence from the Ripper's first victim through the fifth. And, finally, an explanation will be presented as to why three Whitechapel murder victims were not murdered by Jack the Ripper.

Jack the Ripper, Signature Analysis, Modus Operandi

D3 "Who Let the Dogs Out?" The Case of a Staged Homicide

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The goal of this research project is designed to highlight the unique elements of staging, present in a case of a staged homicide.

The concepts of staging or staged elements portrayed within a crime scene are common within certain homicides. Staging can be defined as the purposeful alteration of a crime scene (Douglas, Burgess, Burgess & Ressler, 1992). The concept has been widely written on and has been accepted by the courts as a definable phenomenon. The basis of staging is to direct an investigation away from the person who stages the crime scene, because the person feels he or she would be a likely target of the investigation. Staging can be as simple as an intoxicated driver who wrecks his car, flees the scene, and reports the vehicle stolen. It can also involve a homicide staged to resemble a mugging, burglary, or sexual assault. The person who stages a crime scene, however, does so based upon his/her own experiences and perceptions of how certain crime scenes should look. This flawed perception leads law enforcement and medico-legal investigators to identify a crime scene as staged.

The FBI's National Center for the Analysis of Violent Crime (NCAVC) is routinely consulted by federal, state, and local authorities in cases of serial homicide, homicide, and other violent crimes, and, a significant number of these cases involve staged crime scenes. NCAVC assistance was requested by local authorities in regard to a case involving a woman who was found murdered in her residence. The victim had been strangled with a ligature and her head covered with a cloth, pillow case, and a plastic bag. The crime scene was staged to resemble a "burglary gone bad." There was some ransacking that took place in the bedroom, and the only items missing were \$200 in cash, and a handgun. The residence, however, was locked by deadbolts, which were still secured when the victim was discovered. The victim had three very vicious dogs which could only be handled by the victim, her husband, and daughter. These dogs were secured in a spare bedroom, ironically where the missing money was kept. The police were immediately suspicious of the circumstances, particularly concerning how the dogs came to be secured in the spare bedroom. The investigation quickly focused on the victim's husband as the offender. The investigation revealed the husband was the last person to see the victim alive, and he discovered the body of the victim. Autopsy findings showed the victim died of strangulation, and that the victim was killed a short time after eating. The husband was charged with the homicide.

A thorough analysis was conducted by NCAVC utilizing the crime scene reports, crime scene photographs, autopsy report, laboratory reports and investigative reports. The conclusion was that this was a staged homicide. The basis for that conclusion was a multitude of factors. The residence was occupied at the time of the burglary. Most burglaries are committed when no one is home. The victim's vehicle was parked in the driveway. The burglary occurred during an unusual time for theft. The residence was located in an area that was not easily reached from a main

thoroughfare. The residence had no signs of forced entry, and was secured when the victim was found. There were three protective dogs in the residence. The victim was very security conscious, and the victim's husband worked in law enforcement.

Statistically, burglary as a circumstance of homicide is a very rare occurrence. According to the FBI's Uniform Crime Reports (1996 figures), "Homicides committed during burglaries comprise less than .005% of all burglaries."

The issues involved in this case highlight how law enforcement's ability to recognize staged crime scenes allows investigators to immediately focus an investigation towards a particular offender, and concentrate investigative resources. This provides an opportunity for review by professionals who are able to draw conclusions and present these factors for the trier of facts.

Staging, Homicide, NCAVC

D4 When is a Spree Killer Not a Spree Killer?

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The goal of this research project is learning how to verbally define what the criteria for a spree killer are, how the term has been used in the past, and how some spree killers were actually serial killers.

This presentation seeks to answer the question, "When is a spree killer not a spree killer?" The presentation defines what the necessary criteria are for one to meet the government classification as a spree killer, and how others who have defined spree killing substantially different in the past use that term.

One of the first steps a scientist must take when s/he undertakes the study of something is to define and categorize what one is observing. This is what the Federal Bureau of Investigation's Center for the Analysis of Violent Crime did during a ten-year project when a team of experts adopted standards to define the various types of multiple murderers. These classifications were published in 1992 in the *Crime Classification Manual*. How does the definition of a spree killer in the manual differ from those terms used previously by the media, authors, criminologists, and sometimes, police officers?

The *Crime Classification Manual* defines a spree killing as, "A single event with two or more locations and no emotional cooling off period between murders." The editor of a book published in 1991 by Pinnacle Books entitled *Spree Killers*, defines this kind of killer as, "Men and women who suddenly go berserk, murdering unsuspecting people in a frenzy of blind destruction." Included in that latter book are the killers, John List and Richard Speck. List murdered his entire family including his wife and mother in New Jersey. Speck murdered eight nurses during the night of July 13, 1966, in Chicago. They would have been classified as a "Family Mass Murderer" and "Classic Mass Murderer" respectively according to the FBI's manual. Neither of them would have been considered spree killers. If one closely scrutinizes these cases, it is clear that spree killers can be placed into five additional sub-categories or types based upon their apparent reason for committing the killings and, in some cases, upon their method of operation.

First, there is the spree killer who robs and murders to eliminate witnesses who could possibly testify against him. "Dead people can't talk" is his creed. Charles Starkweather of Lincoln, Nebraska was a man who exemplified this kind of murderer. Although Starkweather has generally been classified as a spree killer, it probably would be more accurate to call him a serial killer since fifty days before he launched his murderous spree where he killed ten people, he murdered a gas station attendant.

The second type of spree killer is the person who kills other human beings in revenge for actual or perceived wrongs. An example of this kind of killer was Mark O. Barton. Barton was a day trader. When he lost

nearly all his money due to risky investments, he blamed his investment advisors. He murdered his wife and his children. Then he went into Atlanta, Georgia where he murdered his investment advisors. Although Barton was classified as a spree killer, he was, however, still the primary suspect in the murder of his first wife and her mother when he committed suicide as police were closing in to arrest him.

The third type of spree killer is one whose apparent reason for committing his crime is to rape, sadistically torture, and finally to take the victim's life. This feeling of power and control over the victim is apparently enhanced when he can overpower, by any means necessary, someone whom the female victim regarded as her protector. An excellent example of this type of killer is Danny Rolling from Shreveport, Louisiana. During the late summer of 1990, Rolling terrorized Gainesville, Florida, by murdering five college students. His method of operation was to burglarize the victim's apartment and attack the victim without warning. While Rolling has generally been classified as a spree killer, eight months before he murdered the five students in Gainesville, he murdered a beautiful, petite young model, her father, and her eight-year-old nephew in Shreveport. He would, therefore, more accurately be classified as a serial killer. Some spree killers have the same reasons for their criminal activities, but their methods of operation vary considerably.

Christopher Wilder of Florida was attracted to young women and girls and posed as a photographer for a fashion magazine to get them to come to his car so he could show them some of his work. At his car he would subdue them, put them into sleeping bags, and transport them to motels where they would be tortured with electric shocks, super glue put over their eye lids, raped, and, when he was through with them he'd kill them. There was one notable exception to all his killings, a sixteen year-old girl whom he had kidnapped in California. After taking her across the United States, he gave her money, put her on a plane in Boston and sent her home.

A fourth sub-category of spree killer is one who is completely, or nearly, out of touch with reality. He is psychotic. Martin Bryant from Australia is such a man. Over a two day period, Bryant killed thirty-five men, women, and children at different times and at different locations.

Finally there is the professional hit man. He is the killer who has a job to do and will kill in several different locations over a very short period of time. He feels no remorse for his crimes since he regards the killings as, "Just taking care of business."

Spree Killers, Serial Killers, Mass Murderers

D5 Sudden Death During Acute Psychotic Episodes

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The goal of this research project is to understand the phenomena of sudden death due to acute psychotic episodes; its presentation and its causes.

Cases of sudden death during or immediately after a violent struggle in which an autopsy fails to reveal an anatomical cause of death appear to be increasing in frequency. Such deaths usually involve police or medical personnel attempting to restrain a violent, irrational individual. The usual presentation is of individuals in excited delirium. They are confused, irrational, hyperactive, and usually violent. In an attempt to restrain the individual from injuring himself/herself and/or others, a violent struggle ensues. Immediately after the struggle ends, the individual abruptly becomes unresponsive, develops cardiopulmonary arrest, and does not respond to cardiopulmonary resuscitation. At autopsy, there is no anatomical cause for the death, though minor injuries may be present. Toxicology tests usually reveal drugs such as cocaine or methamphetamine, presumably the agents causing the excited delirium. Allegations that the individual died from a "choke hold" or "positional

asphyxia" are frequently made.

While such deaths usually involve use of cocaine or methamphetamine, excited delirium may also occur in individuals with endogenous mental disease in the absence of stimulant drugs. Clinically, these are referred to as acute psychotic episodes. These tend to occur in individuals with schizophrenia, schizo-affective disorders or delusional disorders. Acute psychotic episodes occur both in and out of mental facilities. The episode may occur because of discontinuance of medications or development of tolerance to the medications. If the episode occurs outside a mental health facility, it is usually the police who have to deal with the individual; if inside the facility, nursing or support personnel.

Autopsy findings in individuals dying during the course of or after an acute psychotic episode are more varied than in the cases due to drugs. There is often some natural disease present. The exact role natural disease plays in such deaths is debatable and has to be considered on a case-by-case basis. It is the authors' opinion that the principal mechanism of death in such deaths is a fatal cardiac arrhythmia due primarily to the physiological effects of catecholamines and hypokalemia. Typically, collapse and death occur following cessation of the struggle. Following cessation of a violent struggle or any violent exercise, the levels of catecholamine continue to increase for approximately three minutes while the level of potassium drops dramatically, often to hypokalemic levels. These two factors predispose to the development of an arrhythmia. The time following the end of violent physical activity is referred to as the time of "post exercise Peril" by Dimsdale. Contributory to the death may be natural disease and the medications that the patient is on, many of which have a cardiotoxic potential, predisposing an individual to a cardiac arrhythmia. A series of cases will be presented illustrating sudden death in patients experiencing an acute psychotic episode in which neither cocaine nor methamphetamine played a role. Cases in which natural disease was absent, as well as cases in which it was present, will be discussed.

Sudden Death, Psychosis, Manic Delirium

D6 Psychological Expertise and Testimony Under Forensic Scrutiny

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The goal of this research project is to help the attendee understand that forensic psychology expert conclusions should be based on measurable grounds and can be applied even though there are multiple determinants of behavior.

Psychology and law approach the empirical world differently with varying objectives that inevitably affect the resolution of factual queries. Forensic psychology stands at a crossroads in providing an understanding of the evolving legal directives and contrasting professional differences, and in recognizing the independent principles of *justice* and *truth*. While the legal mandates are clear, educating forensic psychologists for the future is a critical challenge. Standardization expected by the legal system is only one piece of this complex puzzle. The audience will be challenged with the professional differences between psychology and law, and offered potential solutions to close the thinking process gaps between these divergent disciplines. The impact of the developing legal mandates, the language differences, the validity of information, ethical considerations, professional judgment, and the role of leadership will be presented. The institutional responsibilities of the legal system to dispense *justice* must be reconciled with the principles of *truth*. An attempt will be made to define the elusive concept of *reasonable psychological certainty*.

In legal cases, the doctrine of inferential relationships is applied in obtaining expert opinions with questions posited from the standpoint of

possibility or probability. It is, however, of value to reframe the expert thinking process in terms of proximity, directionality, and causality. This framework shift supports enhanced interpretation of information allowing the forensic psychologist to render more viable opinions and conclusions based on measurable grounds. The divergence between psychology and law results in the potential for confusion and misinterpretation. This requires education efforts to create understanding to bridge existing gaps.

It is necessary to evaluate the thinking processes used by psychologists in defining, diagnosing, understanding, explaining, and predicting behavior. There are multiple determinants of behavior. In considering psychology to be the study of the mind, the concept should be to understand human behavior through applying scientific principles including theory, taxonomy, instrumentation/measurement, data analysis, and intervention techniques. The intrinsic differences between the scientific/psychological disciplines and the legal profession will be explored while determining the similarities and commonalities to bridge any gap. With the widening of forensic psychology expertise, difficulties of assessment by lawyers, judges, and the courts continue to mount. Understanding the differences, the need for education and training of forensic psychology experts and legal professionals, the availability of information, and evaluating the validity of this information are all mandatory for any potential integration. The use of psychological data, information, and conclusions necessitate that forensic psychologists deal with integration of this information to allow for validity assessment and its presentation in an understandable way.

There is a practical need to deal with issues of admissibility of scientific, psychological, and complex testimony and evidence. The legal mandates embodied in *Frye*, *Dalbert*, *Joiner*, and *Kumho* necessitate review and understanding. These, along with the factor of a qualified expert, constitute the guiding constructs for the admissibility of expert testimony and evidence.

The scientific method guides the development, progress, data collection, data analysis, results, conclusions, and implications of scientific research. Confusion occurs for lawyers and judges in evaluating the meaning of various types of research studies. Similar confusion is generated by the meaning and applicability of published scientific and research literature. The types of research studies (basic science, double-blind, clinical, survey epidemiological) performed, the limitations, validity, and the characteristics of varying formats of publication require definition. The usefulness of any study depends on the quality of the underlying data, the reliability of the methodology, and the validity of the interpretation. An analytical gap may exist between the data and the expert opinion. It is essential to understanding the scientific method by which data should be evaluated, so that psychology expert opinions may be based on reliable methodologies and that may be verified.

Reasonable Psychological Certainty, Inferential Relationships, Measurable Grounds

D7 A Coroner's Death Investigation Influences the Police and Court Response to Domestic Violence

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The goals of this research project are to present a positive outcome of a coroner's investigation and subsequent public inquest on the response of police to intimate assault and the courts' approach to consideration of bail and prosecution of charges of domestic violence.

The role of a coroner in promoting public safety will be discussed. Dr. Porter will present a case of homicide/suicide of a couple involved in an intimate relationship and the impact of their deaths on nine surviving children. The case involved a couple related by marriage (not to each other), that began an intimate affair in 1994. The woman became pregnant

and the violence began during the pregnancy, which resulted in a stillbirth. Violence continued and the woman presented herself to a shelter for assistance in November of 1995. She was encouraged to seek medical treatment and to report the assault to the police. From that time until the time of her death in March of 1996 her partner appeared before the courts fourteen times. The problems of intimidation of the victim, multiple jurisdictional investigations, communication breakdown, and recording errors resulted in the male legally purchasing a firearm, entering the woman's residence, barricading her children in a closet for hours, and then sending them out of the house to call the police. Police responded and surrounded the home. After obtaining no response from the residence, police made entry and found the couple deceased in the bedroom.

The investigation identified a number of areas of concern and an inquest was called. It was the "representative" inquest into domestic violence for the Province of Ontario. The issues explored at the inquest included: the history and familial background of the couple and their previous intimate relationships, an examination of the police response to allegations of domestic violence, the advice given to the victim of the violence, risk assessment, the response of the crown attorneys and the courts to the charges laid, the conditions of bail and subsequent breaches of those conditions, the community responses to the violence, the supports available to the victim, and the impact on the surviving children – present and future.

After hearing from 76 witnesses and 51 days of evidence the inquest jury made 213 recommendations directed to the federal and provincial governments, police services across the province, the Ministries of the Solicitor General and Attorney General, firearms legislation, crown attorneys, courts administration and the judiciary, children's aid societies and victims' services. The implementation of these recommendations and the resultant change in approach of the police and courts to domestic violence will be presented.

The analysis of whether additional resources for police and victim support services and education of the judiciary about domestic violence have reduced the number of deaths will be discussed. New approaches to the social complexities of intimate violence will be offered for consideration.

Coroner, Domestic Violence, Courts

D8 Drowning Deaths in the Early Pediatric Population

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The goals of this research project are to present the findings in a series of fatal drowning in the early pediatric period, including cause and manner of death, to emphasize the importance of cooperation between the death investigator and the pathologist, and to remind those involved in death investigation that determination of the manner of death as homicide is not necessary for prosecution of a negligent caretaker.

Drowning is the second leading cause of accidental injury death in the pediatric population (0-19 years) in most states and in at least three states is the most common cause of non-intentional injury. Homicidal drowning while much less common also occurs particularly in the younger age groups because of their obvious vulnerability. Since drowning is essentially a diagnosis of exclusion, thorough and accurate investigative information is vital in cause, and especially, manner of death determination. Review of the records of the Dallas County Medical Examiners Office (SWIFS) from 1994-1998 revealed 73 cases of drowning in children six years of age or younger with records available for review in 71 of these. The majority of these cases (73%) involved children

four years of age or less with two-thirds between one and four years of age. Only 7% were less than one year old. White children were most commonly involved (44/71 or 62%) with 31 males and 13 females. Black and Latin children were much less commonly involved accounting for 14% and 16% respectively with equal numbers of males and females (five each) in the black population and more males (7) than females (4) in the Latin population. There were four cases involving Oriental males, one Pakistani female and one Middle Eastern male.

Most commonly the incident occurred in a swimming pool (29/71, 41%) with nearly all being residential, either private or apartment complex. One involved a public pool. Even when fences were located around the pool, there was often access through a space in the fence or gate, or the gate was not locked or functional. Lakes (16%), ponds (17%), and creeks (8%) were involved in an additional 41%. Hot tubs were involved in two cases (4%), as were wells and large buckets. In one case each, the event occurred in a drainage ditch or a canal. In only two cases were flotation devices mentioned in the investigative narrative, and in one of these, the father stated that the child was removing the devices at the time he last saw him alive.

May was the month during which the incident most frequently occurred (17/71, 24%), followed by April (11/71, 16%), July (10/71, 14%), August and June (each 7/71, 10%), October (6/71, 8%), November (4/71, 6%), and January and March (each 3/71, 4%). There were single cases in February, September and December (1% each).

In many cases, the approximate time of immersion was not known (23/71, 32%). The immersion time (or the time they were last known alive) was reportedly less than 5 minutes in 14 or 20 %; while in 5/71 (7%) each, the time was reported to be 5 – 10 minutes and 20 minutes. The time was estimated at 45 minutes – 1 hour in 2 cases (3%). Ninety minutes was given as the estimated time since last seen in two cases also. The remainder were reportedly longer than 90 minutes ranging up to a day. Most of the children (60/71, 85%) were transported to the hospital where they were subsequently pronounced dead after periods ranging from minutes to 10 months. Only 11 (15%) were pronounced at the scene.

In the vast majority of cases, a family member was the caretaker (62/71, 87%) with the mother accounting for nearly half of these (30/71, 42%). Other relatives included the grandparents, siblings, aunt, father and stepfather. Family gatherings with many adults present accounted for occasional cases, though, in most of these, the mother was also present. A babysitter was the responsible party in 6% of cases and the caretaker was unknown in 4%. One incident was at a public pool with lifeguards on duty. In the cases involving the stepfather, he actually was the perpetrator of a homicide on the child and the cause of death in both cases also included blunt force injuries.

Only these two cases were classified as homicides with one case undetermined, and the other 68 ruled accidents. In nearly all of the cases classified as accidents, there were scattered cutaneous contusions and abrasions and foci of subscalpular hemorrhage without more serious underlying injury noted by the prosector at the time of autopsy/postmortem examination. In one case, there were skull fractures and neck injury thought secondary to a febrile seizure suffered while momentarily unattended in the bathtub. In the undetermined case, the 7 month old infant was found dead in the bathtub with the mother asleep on the floor next to the tub.

In some cases there were conflicting stories as to who had responsibility for supervision of the child at the time of death. In several of the cases where the incident occurred in the bathtub, older siblings had been placed in the tub with the child (some of them infants). In at least 2 of these cases the sibling admitted to pushing the baby under the water, and in another the decedent slipped and fell. These cases and others in which Child Protective Services became involved were still felt best classified as accidents with the knowledge that designation of the manner of death as accident would not preclude the possibility of future legal action. In at least two other cases charges were filed on the caretaker for neglect though the manner was classified as accident by the pathologist.

In conclusion, the pathologist must rely on the death investigator to provide pertinent and reliable initial information concerning pediatric drowning deaths as well as follow-up when needed. The pathologist must then use this information in addition to the autopsy findings to arrive at the most appropriate cause and manner of death determinations. In spite of the best efforts of the investigator and pathologist, some cases may still be best classified as undetermined with the potential for reclassification if additional information arises. Designation of manner of death as accident or undetermined does not preclude the possibility of legal action against the caretaker.

Drowning Pediatric, Accident, Homicide

D9 Intentional Postmortem Burning of Homicide Victims in Kentucky: 1995-2000

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The goals of this research project are to give the forensic community a five-year study of homicide cases where intentional postmortem burning of the victims, and to outline techniques developed for the successful recovery and laboratory analysis of these victims.

This presentation outlines a five-year study regarding the intentional postmortem burning of homicide victims in the Commonwealth of Kentucky. The number of fire-related cases seen by Medical Examiners across the state during each of these years ranged from sixty-one to eighty-three. The percentage of homicides disguised by fire during this period ranged from 4.8% in 1996 to 24.5% in 1998. From the beginning of 1995 until the end of 1999, there were twenty-eight incidents where a perpetrator or perpetrators intentionally set a fire in an apparent attempt to disguise or destroy evidence of homicide. These twenty-eight incidents involved a total of forty-one victims. All but nine of these victims were burned in a structure or in a vehicle. There were three incidents involving three victims, and seven incidents involving two victims. All other incidents involved single victims. Homicide was officially determined to be the manner of death in all of these cases. In twenty-seven of these, the cause of death was gunshot wound, with one of these gunshot wound victims also run over by a vehicle. In eight cases, the cause of death was blunt force trauma, with three of these victims also stabbed. One of the victims of blunt force trauma was also strangled. One victim was stabbed to death and one was suffocated. In four victims the cause of death was not determined.

One of the most interesting findings in this study is the geographic concentration of incidents. A majority of these cases were concentrated in the southeast corner of the state. Seventeen victims were killed and then burned in the four adjacent counties of Knox, Laurel, Pulaski, and Whitley.

With this large percentage of confirmed cases involving the intentional postmortem burning of homicide cases, it was essential to try and develop protocols that could help first responders as well as investigators recognize and protect evidence associated with charred human remains. It was also essential to provide timely consultation and collaborative field recovery efforts with a forensic anthropologist or a medical examiner at suspicious fire scenes that involved severely burned human remains. The Commonwealth of Kentucky's Medical Examiner Division and several members of the Kentucky Coroners Association worked together to develop these protocols as well as specific training regimens dealing with the recovery, analysis, and identification of charred remains.

As in any crime-scene investigation, the complete and careful recovery of the remains depends on careful location and documentation of the body in relation to associated evidence. With severely burned bodies, this should be followed by systematic recovery and analysis of the extremities before any part of the torso is disturbed. Collection of

underlying debris, which is then subjected to radiographic examination, has often proved to be a good method for finding associated evidence in an amorphous mass of burned material. Examination by a forensic anthropologist working alongside the pathologist is standard protocol in those cases where any degree of skeletonization has occurred. In cases of extreme incineration, the entire recovery and examination is usually directed by the forensic anthropologist. An experienced professional examiner from the State Fire Marshal's Office, as well as a consulting odontologist is often present at the autopsy. This has also proved to be a valuable collaborative professional arrangement.

A heightened awareness of the high percentage of intentional postmortem burning of homicide victims in Kentucky has resulted in a systematic approach to the recovery and analysis of burned human remains. It has also proved invaluable in the prosecution of these cases.

Homicide, Fire, Forensic Anthropology

D10 Exhaust Fume Deaths With Non-Toxic Carbon Monoxide Levels

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The goals of this research project are to present to the forensic community a case series of suicidal exhaust fume deaths with non-toxic levels of carbon monoxide, with an explanation of the mechanism of hypoxic death.

The intentional inhalation of motor vehicle exhaust fumes with secondary toxic levels of carbon monoxide remains a common method of suicide in industrialized nations. During this presentation, a case series of seven deaths from the Ontario Coroner's System between July 1, 1997, and December 31, 2000, (42 months), from intentional exhaust fume inhalation with non-toxic ("normal") CO levels will be reviewed.

The decedents were all males with an age range of 28-54 years (median 44 years). The following features were common to all cases: vehicles had functioning catalytic converters; vehicles had been driven (and "warmed up") prior to the suicidal act; hoses were connected from the exhaust tailpipe to the interior compartment of the vehicle; vehicle compartments were well sealed; no anatomical cause of death found at autopsy; CO levels < 6% saturation and no toxicological cause of death on drug and alcohol testing. In five cases, alcohol was present in the blood (range 22- 94 mg/100 ml) and in four cases, toxicological testing revealed various combinations of drugs in non-lethal concentrations.

Death in all seven cases was attributed to hypoxia resulting from the diversion of catalytically converted exhaust fumes into the interior of well sealed vehicle compartments. Asphyxia under these circumstances is dependent upon a warmed up, properly functioning catalytic converter. The circumstances leading to an accumulation of carbon dioxide, reduced inspired oxygen concentration and hypoxia will be reviewed. Under these conditions, CO levels would be expected to be non-toxic.

It is important that Forensic investigators are aware of this mechanism of death in order to collect relevant information at the death scene, and to appreciate the significance of and explanation for a non-toxic CO level during toxicological testing.

Exhaust Fume, Carbon Monoxide Levels, Non-Toxic

D11 An Interdisciplinary Approach to the Study of Forensic Science

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The goal of this research project is to make aware to the forensic community the availability of an interdisciplinary forensic science major.

Undergraduate programs in forensic science have in the past focused on one or possibly two areas within forensic science with criminology, chemistry, and psychology being in the majority. Baylor University has developed a highly successful forensic science major incorporating all the sections in the Academy of Forensic Science as well as many others. This innovative program was initiated to target pre-medical students to give these students an applied program while they simultaneously took all required pre-medical courses. The author recognized the need for such a program while participating on the pre-medical advisory board at Baylor University. It was noticed that during the interview process students had little or no hands-on experience in traumatic events or had not observed death.

The major, in its second year, has drawn much attention nationwide. There are 300 declared majors making this one of the larger programs on the Baylor campus. Subjects taught include all the pre-medical requirements as well as forensic entomology, forensic anthropology, forensic archaeology, psychological profiling, hostage negotiation, crime scene investigation, criminology, death scene investigation, forensic photography, medicolegal investigation, and forensic pathology. Students have nine semester hours of internship that include working with the medical examiner, forensic odontologist, toxicologist, trace evidence laboratories, or wherever their interest. The students also have the opportunity to travel with the author to all forensic cases. They see first hand how to handle the collection of human remains and accustom themselves to working with decomposing bodies.

The Baylor Laboratory for Degradation and Preservation Science serves as a research and teaching laboratory. Any forensic science major has complete access to the research facility and all research projects are highly encouraged. The laboratory also owns a fifteen-passenger van with a moving laboratory in an attached trailer. The trailer is air conditioned with electrical outlets. It houses all the necessary forensic retrieval equipment for working in the field. In addition, a full forensic entomology lab is also located here. Whenever a decomposing body is found, the forensic science team is called to the case to collect all insect activity. They can assist in establishing time of death and also add to an insect collection located in the research laboratory. The collection is a collaborative effort with the Forensic Entomology department at Texas A&M University in College Station, Texas. It serves as a database of insect activity on decomposing bodies in Central Texas.

These students are excellent applicants to medical school and graduate schools. They have a very diverse and interdisciplinary background. All graduates are either in the graduate school of their choice or attend medical school.

Forensic Science, Education, Interdisciplinary

D12 Suicide: A Comparison of Five Counties Over Five Years (1994-1998) Using Medical Examiner/Coroner Office Records

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The goal of this research project is to demonstrate that suicide prevention and therapy programs should utilize both local and national data and should further our understanding of suicide.

The Office of the Hamilton County Medical Examiner conducted a five-year comparative study of 1,116 suicides using medical examiner/coroner (ME/C) office records from five different counties. The five counties (and major cities) from West to East are Clark County, WA (Vancouver), Washoe County, NV (Reno), Hamilton County, TN (Chattanooga), Erie County, PA (Erie), and Lehigh County, PA

(Allentown). The primary hypothesis tested in our study was that ME/C offices that service populations of similar jurisdictional size certify an equal number of suicide death certificates per year. Hamilton County's mean population for the five-year period was 294,308, so ME/C offices serving between 275,000 and 325,000 (~±25,000) were chosen for the study. Five of the twenty-three offices falling within this parameter responded to our questionnaire, thus making our sample one of convenience and not a truly random sample. Additionally, our sample is over time, geographically disperse, and encompasses both medical examiner offices and coroner offices.

Despite the sample's non-random nature, using jurisdictional population size as the constant has some theoretical foundation. Sociologist Robert Merton in the mid-20th century postulated his *strain theory* to explain deviant behavior. Strain theory essentially provides a functionalist perspective on deviance in society, which we adapt here to mean the social pressures felt by any one individual when he/she fails to achieve a desired outcome, or when access to the means to achieve a desired outcome is blocked. The result of this strain is what sociologist Emile Durkheim calls "anomie," a feeling of social dislocation and detachment that, if not adapted to or overcome, leads the individual to chose suicide. Examining suicide at more local levels, or relative to a particular community's social strain, leads to a better understanding of its nature within that particular community. This can provide the foundation for more effective prevention and survivor-therapy programs. National figures alone tend to generalize or "wash out" the local picture.

The results of our study show the five-year mean annual rate of suicides per 100,000 for each county studied are: Clark, WA (10.03), Erie, PA (10.91), Hamilton, TN (13.25), Lehigh, PA (13.67), and Washoe, NV (27.32). Clearly, as indicated by the high rate, the social strain unique to the population in Washoe County, NV, warrants further study to tailor prevention and therapy programs specific to that community's needs.

To better understand the nature of suicide at local levels, we also examined race, sex, age, and method of suicide. For all five counties (n=1,116) combined over the five-year period, the most frequent race and sex was white male, with a mean age of 45 years, median age of 42, and standard deviation of 18.21. The most common method of demise for all five counties was gunshot wounds (50% of males, 9% of females). Beyond age, sex, race, and method, not all of the variables we wished to examine were obtained from the contributing ME/C offices. These variables included marital status, toxicology, and employment. The marital statistics from four counties were as follows (n=704): married (44%), single (31%), divorced (17%), widowed (7%), and not reported (1%). The percentages of victims with negative toxicology are (n=500): Hamilton, TN (43%), Clark, WA (34%), and Erie, PA (16%). Employment for three counties (n=479) ranges from white collar to unemployed.

Additional data come from Hamilton County only and are provided as peripheral information for other researchers to compare their own data, and to further expand our understanding of the nature of suicide. These data are educational level in years (<12 = 23%, 12 = 39%, >12 = 33%, not reported = 5%); blood alcohol content (<0.1 = 38%, >0.1 = 62%); the most common day of the week (Sunday) and month (August); correlation with lunar phases; and, reasons why the individuals committed suicide. We also discuss the disagreements and their causes between ME/C office data and state vital record data.

In conclusion, the local level examination of suicide should be used in conjunction with state vital statistical records to design prevention and survivor-therapy programs for that particular community's needs.

Suicide, Strain Theory, Anomie

D13 Sexual Assault of Young Children in Istanbul: Victim and Offender Characteristics

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The goals of this research project are to present to the forensic community a comprehensive overview of current knowledge about the incidence and prevalence of violent victimization of children by sexual assault, the response of the criminal justice system to such, and crimes the characteristics of the offenders, victims, and scenes of crime.

Over the past years, the problem of child sexual victimization has received significant attention from researchers, clinicians, and policymakers. The presented data is based on reports from law enforcement agencies and criminal court case files of Istanbul, Turkey and covers the years 1999 through 2001. Findings include statistics on the incidence of sexual assault, the victims, their offenders, gender, response to these crimes, locality, the levels of victim injury, and victim-offender relationships. Highlights include the following: Sixty-eight percent of all victims of sexual assault reported to law enforcement agencies were juveniles (under the age of 18); 42 percent of all victims were under age 15, one of sixteen victims of sexual assault reported to law enforcement agencies were under age six, and twenty-two percent of the offenders who victimized children under age six were juveniles (under the age of 18).

Crimes Against Children, Sexual Assault Victims, Sex Offenders

D14 Anti-Stalking Legislation: The First Decade

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The goal of this research project is to present an integrated approach to the management of the offense of stalking, from the law enforcement, victim advocacy, and clinical treatment community perspectives.

In late 1999, New York became the last of the fifty states to enact specific legislation establishing the criminal offense of stalking. While this new law may be a necessary first step toward protecting victims of the crime of stalking, it is not sufficient in and of itself to ensure that stalking victims receive proper support and services. Those on the front lines of the criminal justice system must not only be aware of the new law, but must understand its implications for victims and for the prosecution of these offenses, and have a good, general understanding of stalking and its sequelae.

This paper will explore how the Clinic Access and Anti-Stalking Act of 1999 (effective December 1, 1999) was shaped by the past ten years of experience in other jurisdictions. It will also highlight the major elements of the law, and the further actions needed to ensure appropriate implementation.

Stalking, Psychological Treatment, Victim Services

D15 Exploring the Needs of Victims of Stalking

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The goal of this research project is to present an integrated approach to the management of the offense of stalking, from law enforcement, victim advocacy, and clinical treatment community perspectives.

Most attention on stalking crimes has been focused on the perpetrator. There is limited research available on the response of the victim, and how falling victim to this type of predator impacts on them, their family, their employer, and any other present or future relationships that the victim may have. This presentation will explore the effect that a stalker can have on the victim's life. Included are a description of the services most frequently requested by stalking victims; the impact of

gender, class, religion, culture, other societal influences on the system's responses to the crime; behavioral and psychological changes brought about by stalking; and, social and financial impacts on stalking victims.

Stalking, Psychological Treatment, Victim Services

D16 Serial Stalking

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The goal of this research project is to present an integrated approach to the management of the offense of stalking, from law enforcement, victim advocacy, and clinical treatment community perspectives.

Stalking is by definition a crime of repetitive behavior, requiring more than one act by the perpetrator before charges can be brought. This research posits that while some stalkers can be deterred by the efforts of law enforcement, others will continue their stalking behavior regardless of legal intervention. A distinction is made between serial stalkers, who have targeted distinct victims over time, and persistent stalkers, whose harassment of one defined victim continues for months or years, even after the courts have interceded.

Stalking, Psychological Treatment, Victim Services

D17 Treatment for Stalking Offenders

Barry D. Rosenfeld, PhD, Department of Psychology, Fordham University, Dealy Hall 319, Bronx, NY*

The goal of this research project is to present an integrated approach to the management of the offense of stalking from law enforcement, victim advocacy, and clinical treatment community perspectives.

Although much of the research regarding stalking behavior has focused on defining and describing the perpetrators of this offense, very little emphasis to date has been placed on the treatment of this difficult population. This presentation will describe the factors associated with stalking recidivism and outline a model treatment program that is currently being developed to reduce stalking behaviors.

Stalking, Psychological Treatment, Victim Services

D18 Stalking Behavior and Voyeurism: A Case Study

Ken Cullen, MSW, Executive Director, CAP Behavior, 175 Remsen Street, 5th Floor, Brooklyn, NY*

The goal of this research project is to present an integrated approach to the management of the offense of stalking, from law enforcement, victim advocacy, and clinical treatment community perspectives.

This is a presentation of a case study involving voyeurism and stalking behavior, from the records of CAP Behavior, a New York City based agency specializing in the treatment of sex offenders. The application of the polygraph in the management of behavioral problems is reviewed. The polygraph is used as a tool in the assessment and monitoring of patient compliance with the treatment regimen and the orders of the court. The case study will demonstrate the need for legal

authorities (such as Probation, Parole and the Courts) to work closely with treatment providers on case management issues.

Stalking, Psychological Treatment, Victim Services

D19 A Review of Forensic Computer Science Analysis Areas and Practices

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The goals of this research project are to provide an overview of the Forensic Computer Science areas of analysis, minimum standards and practices, and identify areas for future research and development. Attendees will have an understanding of three areas of analysis, techniques and problems in performing the analysis, and minimum practices when conducting such analysis.

The goal of this project was to review the various work programs using forensic computer science and related tasks being supported by the MITRE Corporation, examine the minimum standards for such work, and identify areas for future research and development. Defining minimum standards was complicated as a result of different agencies having different requirements both in investigative purview and legal sufficiency. It was still important to identify the most common tasks, what tools or techniques were utilized, and attempt to determine the best practices for such analysis. Additionally, it was important to identify areas where there were inadequate guidelines, standards or tools, so that future research efforts can work towards their development. For the purposes of this project, forensic computer science examinations were divided into three categories: media analysis, code analysis, and network traffic analysis. Many other types of analysis could be identified; however, many of the other types could be considered combinations of these three primary types. The areas are further defined below:

Media Analysis

Media analysis is perhaps the most widely known and recognized type of forensic computer science examination. Media analysis is the examination of data storage media to determine the digital contents of the media and the state of the contents. Often, operating systems will retain and store bits and pieces of previously deleted files, or files that have been accessed or modified by programs running on the operating system. A forensic computer scientist may be able to partially, or even completely, re-construct files that were deleted from the system. Conducting this type of analysis requires detailed knowledge of different operating systems, storage devices, interfaces, different types of media and file types.

Code Analysis & Reverse Engineering

Code analysis is the process of reviewing computer programs to determine the purpose and results of the execution of those programs. In today's world of highly interconnected networks and large numbers of privately owned computer systems with routine access to the Internet, hostile code has the means to be spread around the globe in a matter of hours. Identifying code and conducting detailed analysis of that code may enable the forensic computer scientist to identify a number of characteristics that could identify or eliminate suspect systems as the potential source of that code. Conducting such analysis requires detailed knowledge of operating systems, programming languages, programming techniques, interfaces, and protocols.

Network Traffic Analysis

Network traffic analysis is a process to determine events occurring on a network, their sequence, their significance and the resulting effect(s) on the computer systems in question. This analysis requires a detailed knowledge of communications protocols, networking systems (routers, firewalls, servers, switches, hubs, intrusion detection systems, etc.), computer systems and the vulnerabilities and weaknesses in all

three.

Results

The result of the investigation the identification of minimum standards for conducting each type of analysis, as well as the identification of shortfalls in tools and procedures for conducting such analysis. Additionally, a substantial collection of reference material including information on file types, some basic analysis checklists for conducting media analysis, and a listing/inventory of tools used for forensic analysis was compiled.

Forensic Computer Science, Media Analysis, Network Traffic Analysis

D20 Comparing the Resolution of Film to Digital Cameras: Cautions for the Forensic Community

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The goals of this research project are to provide the forensic community with a better understanding of how much more information can be recorded by film than by most digital cameras, and, to alert the community to some possible consequences if the resolution available with film is abandoned for mere convenience.

Law enforcement agencies across the country and around the world are rushing to convert their photographic and imaging systems from traditional film systems to digital ones. Many of the decisions to do so are being made based on the perception that digital imaging is better than traditional film systems. Although digital cameras can provide some benefits over film, those who must conduct detailed analysis of photographs taken in a forensic environment — such as footwear and tire tread examiners — are discovering that the quality of digital photography does not, yet, match that of film. This paper will explain one reason for this observation.

Resolution is defined in ANSI/AIIM Technical Report TR26-1993 “Resolution as it Relates to Photographic and Electronic Imaging” as “The ability of a photographic system to record fine detail.” Although the quality of images recorded using any imaging system depends upon a number of factors, including the quality of the lenses used and the lighting conditions, the intrinsic resolution of the detectors represents the most fundamental measure of the system. Thus sensor resolution is the focus of this paper.

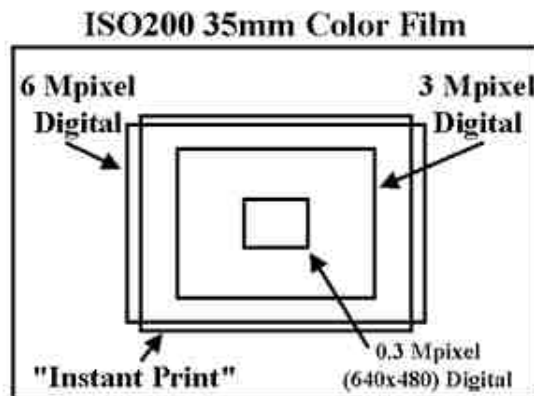
Traditionally, film manufacturers have measured resolution in terms of line pairs per millimeter (lp/mm) or lines per millimeter. A line pair consists of a black line and an adjacent white line. Lines per millimeter refers to each individual line (black or white), thus there are always twice as many lines as there are line pairs over a given distance. The resolution of digital cameras is frequently described in terms of the total number of pixels in a single frame, or as the number of pixels in the horizontal and vertical direction. It is possible to directly compare the maximum amount of information that can be represented by any two sensors by comparing the total number of pixels per frame. To compare film to the sensors in digital cameras it is necessary to relate line pairs per frame to pixels per frame.

Under idealized conditions, two pixel columns (or rows) represent one line pair. Using such a conversion factor, a single frame of 35-mm color ISO 200 film, rated at 50 lp/mm, would contain 3600 x 2400 pixels, for a total of 8.64-million pixels. Such resolution compares quite favorably against a 3-Megapixel digital camera commonly encountered in law enforcement applications, which only has 2008 x 1504 pixels for a total of 3.02-million pixels. If one equates number of pixels to information, then the film records almost three times the information

recorded with the digital camera.

The analytical resolution that can be achieved using digital cameras will be less than the ideal described above. Some researchers suggest that it may be more appropriate to represent one film line pair using three or more pixel columns. Such an assumption has the effect of reducing the quality of digital detectors relative to film to an even higher degree.

The figure below



demonstrates just how much more information film could record than digital detectors, under idealized conditions, if one fixes the resolution within the scene. In other words, the same size feature — such as a single ridge on a fingerprint — can be seen in each of the areas noted, but the film covers more area at that resolution than the digital detectors do.

Consequences: Examiners of footwear and tire tread impression evidence are already facing the consequences of reduced image quality. Although no formal studies have been conducted, discussions with numerous examiners indicate that the number of “inconclusive” results in these examinations is increasing at a rate that parallels the rate at which digital images are submitted for comparison. Another type of examination that could suffer from reduced image quality is blood spatter examinations. One community, the latent fingerprint community, is fortunate enough to have a recommended standard in place for the capture of latent impression evidence — 1000 pixels per inch. Although this standard was designed to meet transmission standards, it has the added benefit of placing a minimum resolution standard for image capture. Using this standard, a photographer who chooses to photograph a latent print with a typical 3-Megapixel camera (2000 x 1500 pixels) will be restricted to photographing an area 2” x 1.5” - an area slightly larger than that covered by a single fingerprint.

Forensic Photography, Digital Imaging, Footwear Impression

D21 An Evaluation of Ferromagnetic and Non-Ferromagnetic Fingerprint Powder on Ceramic Materials

James A. Bailey, MS, 617 Chestnut Street, Wilmington, NC*

After attending this presentation, the participant will understand: (1) the use of ferromagnetic fingerprint powder compared to non-ferromagnetic fingerprint powder used to process the surface of glazed ceramics, (2) variables that affect the condition of latent fingerprints, and (3) a method of assessing and evaluating the quality of latent prints based on their appearance.

The purpose of this presentation is to present the results of a study that evaluates the quality of latent prints collected from the surface of glazed ceramics using ferromagnetic and non-magnetic fingerprint powders. In general, ceramic type material is typical when processing crime scenes, especially in residential burglary cases. The use of the powder method for processing surfaces or items is routine in investigations where objects may have been touched recently by

perpetrators. However, some fingerprint powders have different adhesive qualities based on the characteristics of the powder as well as the surface or matrix of the object being processed.

The investigator's awareness of the magnetic interference using ferromagnetic powder on the surface of ceramics will provide him/her with a better understanding and utilization of this type of powder.

The familiarity with processing recently touched glazed ceramics with ferromagnetic powders compared to non-ferromagnetic powder will provide the investigator with information on latent print quality and the interference of ferromagnetic powder with the matrix of ceramic material. Ferromagnetic powders adhere more readily to the surface of ceramic material than non-ferromagnetic powders because the matrix of ceramic material contains minerals that have some magnetic properties.

The term ceramics refers to non-metallic inorganic material including pottery, porcelain, tiles, and bricks. The base material used in ceramics is clay and the clay contains minerals that are magnetic. When a ferromagnetic fingerprint powder is used to dust the surface of a ceramic material, there is interference from the two magnetic materials that come into contact with each other. This interference affects the quality of the resulting latent prints because there is more powder adhering to the background or area around the latent print.

In addition to the two types of fingerprint powders used in this study, there are other variables that affect the quality of latent prints obtained from evidentiary objects at the crime scenes. Some of those variables include: the age of the print, the chemical composition of the perspiration, climatologic environment, the porosity of the surface, the material type and its matrix, as well as the type of latent print method such as powders or chemicals that are used to process the objects. The estimated age of the latent print is an important factor used in selecting the processing method. The age of the latent print may not be known by the investigator but can sometimes be estimated based on information from witnesses or persons who had knowledge of the conditions at the scene before it was altered.

For this fingerprint study, twenty cups were collected from flea markets and yard sales. The sampling includes cups of various qualities. Some are marked as fine china and others as stoneware or ordinary cups. The outside surface of each cup was selected for testing. The range of thickness for the cups' sides is from .090 to .270 thousands of an inch. The average thickness is .204 thousands of an inch. The cups are mostly white to cream in color with the presence of company logos and other designs present with different colors. The area selected for testing is absent of any logo or designs. The impression on the bottom of the cups revealed that one-cup was from Bavaria, five from China, two from England, four from Japan, one from Korea, one from Taiwan, two from Thailand, and four from the United States.

The cups were washed and wiped cleaned before testing. An area was circled in pencil on the outside of the cup and a latent print placed inside the marked area. An impression with the same approximate pressure was used to leave each of the latent impressions. The hands of an adult female were dipped in a water solution to obtain the same amount of residue on each finger. The hands were allowed to dry for 5 minutes and the cups were kept in a room at 70 degrees Fahrenheit for two hours before dusting for latent prints. Black ferromagnetic and non-ferromagnetic powders were used to process each of the ceramic cups.

A Likert type scale was developed and used to evaluate the quality of each latent print in the study. Latent prints were given a number between 1-5 depending on the evaluator's assessment of each print. The latent print scale included: 1) acceptable ridge detail with some powder adhering to the background surface, 2) some ridge detail present with light amount of powder adhering to the background surface, 3) some ridge detail present with moderate amount of powder adhering to the background surface, 4) no ridge detail present with light amount of powder adhering to the background surface, and 5) no ridge detail present with moderate amount of powder adhering to the background surface.

The quality of each print was evaluated after the impression was lifted from the ceramic material and placed on a latent lift card using clear

two-inch latent lift tape. The evaluation of the impression was performed using four-power magnification.

The results of the study indicated that ferromagnetic powder produced better quality latent prints even though there was more background powder adhering to the glazed surface of the ceramics than the non-ferromagnetic powder. The ferromagnetic powder produced some ridge detail on 35 % of the cups processed and 15% of the impressions had acceptable ridge detail for comparison purposes. The non-ferromagnetic powder produced some ridge detail on 30 % of the cups, but none with acceptable ridge detail for comparison purposes. Using non-ferromagnetic powder, 70 % of the cups processed had no ridge detail and but had some adhesion of the powder to the background. Using ferromagnetic powder, 65 % of the cups processed had no ridge detail but had a moderate amount of powder adhering to the background. There was no observable difference for either type of powder based on the thickness of the cups; however, there were some detectable differences in the degree of magnetic attraction between the magnetic powder applicator and some of ceramic cups.

Fingerprint Powder, Latent Prints, Ceramics

D22 Investigation of Abuse in Nursing Homes

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The goal of this research project is to provide an understanding of the investigation process of resident abuse occurring in nursing homes.

The government for abuse of residents has cited over one-third of the nation's nursing homes. This is almost double from the 1996 figures and yet many instances of abuses still go unreported.

Federal Health Care Finance Administration(HCFA) in its Medicare State Operations Manual defines abuses as follows: Verbal abuse is the use of oral, written or gestured language to the resident or his/her family. Sexual abuse includes, but is not limited to, sexual harassment, coercion, or assault. Mental abuse is humiliation, harassment, threats of punishment and deprivation of services. Involuntary seclusion is another form of abuse which is the separation of a resident from other residents. Finally, the worst form of abuse in the nursing homes is corporal punishment which includes hitting, slapping, pinching, and kicking the resident to control his/her behavior.

Federal law requires nursing homes to develop and implement policies and procedures to prevent abuse which include: screening employees and training and educating the staff and families on what constitutes abuse and what must be reported for prevention of abuse in the nursing home.

All surveyors are trained by state and federal agencies and must pass the surveyor minimum qualification test, which is a federal mandated surveyor examination, before they are authorized to survey facilities.

The investigation of abuse follows the pertinent survey tasks for a regular or standard survey as specified in the survey procedures for Long Term Care Facilities. TASK 1. The complaint investigator must review the complaint and conduct a telephone interview, if possible, with the complainant. Specific dates and names are extremely important to obtain and clarify the who, what, when, where and why of the written complaint. TASK 2. The complaint investigator enters the nursing facility unannounced and is required to notify the administrator or the designee administrator the nature of the complaint. The facility staff is advised of the nature of the complaint, but the complaint investigator reveals no names of complainant or residents. TASK 3. The complaint investigator obtains a list of all residents residing in the facility. The investigator usually takes a brief tour of the facility to review the appearance of the residents, delivery of services to the residents, staff interaction with residents, physical environment, and other areas related to the complaint. The investigator will obtain vital information concerning the abuse. This

is followed by a review of records and related documentation. TASK 4. The investigator reviews all the information collected to determine if there are inconsistencies or if additional data collection is needed. If the investigator substantiates the abuse, the facility is cited for violating one or more of the approximately 350 federal and state regulations. The investigator must determine the scope and severity of the deficiency. TASK 5. There is an exit conference conducted by the investigator with the nursing home administrator. The administrator is informed of the findings of the investigation and also the deficiencies. The administrator will be instructed that these citations will be written as a statement of deficiencies and reviewed by the investigator's supervisor.

The statement of deficiencies is a written document of the investigation and the citations. This document is prepared according to the federal requirements utilizing the principles of documentation. The statements are written in terms that a lay person can understand. The report and a statement of remedies are sent to the facility. The complainant is sent a copy of the report. The facility must respond to the state agency with a Plan of Correction within ten days. The remedy for an abuse deficient practice can range from a fine of \$100 to \$10,000 or more, depending on the level of harm to the resident.

The facility administrator states a date, usually about 50 days, that he/she will have corrected the deficient practice on the plan of correction. Following this date, the facility is revisited by the state agency to ensure that the deficient practice has been corrected.

The facility is required to investigate all alleged or suspected abuse, and if validated, report the results of the investigation to the state agency responsible for the licensure and certification of the nursing home and to the state nurse aide registry or licensing authorities.

Elder Abuse, Nursing Homes, Investigation

D23 Postmortem Genital Examinations

Sharon R. Crowley, RN, MN*, Forensic Clinical Nurse Specialist, 122 Emeline Avenue, Santa Cruz, CA

The goals of this research project are to discuss current research on postmortem genital anatomy. The objective is to describe the salient findings accumulated during the first year of clinical adaptation of sexual homicide, research undertaken by this author since 1995.

Collaboration of a Forensic Clinical Nurse Specialist with a Criminal Investigative Analyst illustrated the complementary nature of the two disciplines during the investigation of sexual homicide (Crowley & Prodan, 1996). A *Sequential Methodology for the Examination of Sexual Homicide Victims* (©Crowley, 2001) was developed to respond to the need for a systematic approach to the genital evaluation of deceased sexual homicide victims (AAFS, 1998). This protocol, which incorporated colposcopy, was refined and other aspects were expanded. These included the collaborative role of the Forensic Nurse and Forensic Pathologist, the use of reflective and fluorescent imaging, and the sexual homicide database (Crowley, Barsley, Peterson, & Wood (AAFS, 2000).

The use of colposcopy in living sexual assault victims is well established. Patterns of injury have been described, and findings compared to a control group of women who engaged in consensual sex (Slaughter, Brown, Crowley, and Peck, 1997). Prior to the incorporation of colposcopy for the evaluation of living sexual assault victims, traditional methods of exam yielded a paucity of physical findings (10-30%). Similarly, during the autopsy, gross visualization alone may not allow detection of the more subtle findings that usually constitute genital trauma during sexual assault. The colposcope affords both magnification and photographic capability. This enhances visualization, provides photo documentation, and makes peer review possible. Higher magnifications make it feasible to study the effects of the postmortem interval and other factors on the anogenital tissue.

Materials and Methods:

Eighteen deceased patients (15 female; 3 male) were evaluated using a protocol that included colposcopy. Causes of death included suicide,

accidental, and natural. All cases were examined using the mobile system of technology described by Crowley (AAFS, 2001). Examinations were done in collaboration with Brian Peterson, MD, Forensic Medical Group, Inc., of Fairfield, CA. Photographs were available for review on 10 cases, all female. In this group, the ages ranged from 6 years to 72 years old, with a mean age of 48.8 years. The postmortem interval varied from < 24 hours through several days, with active decay. All but one of the cases was examined with colposcopy, using a fixed magnification of either 7.5X or 15X. In most cases, photographs were also obtained using a 35mm SLR camera, for comparison with colposcopy. Two cases were documented only with macro-photography. The cases were assigned an identification number and entered into a modified version of the *Sexual Homicide Database* (Crowley, AAFS, 2000). Data included the age, ethnicity, race, date of exam, postmortem interval, cause of death, major medical conditions, reproductive status, known gynecological history, gross non-genital trauma, and exam technique. Eleven anatomic sites were included for review. These included the labia majora, labia minora, peri-urethral area, posterior fourchette, fossa navicularis, hymen, vagina, cervix, perineum, anus, and rectum. The nature and pattern of postmortem genital findings are described in a manner consistent with conventional design, i.e., sharp vs. blunt force. The database provides a conceptual framework in which to analyze data and evidence, categorize postmortem genital findings, and describe anogenital anatomy. Careful study of "normal" postmortem anogenital anatomy will allow eventual comparison to the physical findings of sexual homicide victims.

Colposcopy, Sexual Homicide, Genital Anatomy

D24 Enhancement of the NIST Human Mitochondrial DNA Standard Reference Material 2392 — Addition of DNA From the HL60 Cell Line

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The goal of this research project is to learn how NIST plans to enhance the current human mitochondrial DNA (mtDNA) Standard Reference Material for sequencing the entire mtDNA. The outcome will be an improved SRM which will provide greater utility to the FBI and forensic laboratories.

Every human cell has from a few dozen to several thousand mitochondria, each of which contains mitochondrial DNA (mtDNA). The sequence of the entire human mtDNA (16,569 bp) was determined and published by Anderson et al. in 1981 (Nature 290:459-465). MtDNA is used by the forensic community for human identification and by the medical community for diagnoses of a number of human diseases now known to be associated with specific mutations and deletions of mtDNA. A mtDNA Standard Reference Material (SRM 2392) was prepared by the National Institute of Standards and Technology to provide quality control to the scientific community when they amplify and sequence human mtDNA. This SRM includes two human DNA templates (CHR and 9947A) and all the information necessary to successfully conduct the PCR amplification process, cycle sequencing steps, gel separation, and data analysis to obtain the final DNA sequence. The information on the sequence of 58 unique primer sets that allow the sequencing of the entire mtDNA is also provided. This SRM also includes information on the sequence of a third human mtDNA that is not provided in SRM 2392 but can be obtained from a cell culture line available from Coriell Repository. Following an interlaboratory evaluation, this initial version of Standard Reference Material 2392 was completed and released to the public in December, 1999 (Levin et al., 1999. Genomics 55:135-146).

DNA testing to identify unknown human remains has become a very important program within the law enforcement community. To promote this program, additional indices have been added to the CODIS

(Combined DNA Index System) program of the Federal Bureau of Investigation (FBI) to include mtDNA sequences (and nuclear DNA loci when possible) from unidentified remains, as well as from relatives of missing persons. In order for authorized laboratories to contribute or upload to these indices, the FBI has deemed that certain quality standards must be met. In particular, a positive control from the human cell line HL60 must be run in conjunction with the sample. HL60 was chosen by the FBI Laboratory as the positive control because of several features present in HL60 but not in the cell lines currently available in NIST 2392. Some of the advantageous features of HL60 are well-spaced polymorphisms throughout the HV1 and HV2 areas of the mtDNA control region, and no insertions at the HV2 C-stretch area (positions 303-310). The CHR DNA has a C-stretch in the HV1 region caused by a T to C change at position 16189. Sequencing through this C-stretch is difficult and results in the need to perform additional sequencing reactions to resolve this region. The CHR template was chosen by NIST specifically for the C-stretch region since some laboratories wanted the opportunity to specifically address this difficult sequencing problem and try to resolve it. The DNA from 9947A has only one polymorphism in the HV1 region with respect to the Cambridge Reference Sequence (Anderson et al., 1981) and that polymorphism is a common site. For the work that the FBI is doing on human identification, several evenly spaced polymorphisms are more desirable to differentiate the positive control from the test sample. Thus, the FBI suggested to NIST that the addition of HL60 to SRM 2392 would greatly increase its utility. This work is currently in progress and we will report on our accomplishments to date.

The FBI needs DNA Standard Reference Materials to provide the quality control and assurance that the results from sequencing unknown samples are correct. On July 15, 1998, the FBI Director signed Standard 9.5 that stated "The laboratory shall check its DNA procedures annually or whenever substantial changes are made to the protocol(s) against an appropriate and available NIST Standard Reference Material or standard traceable to a NIST standard." With the addition of HL60 to the NIST human mtDNA sequencing standard 2392, this standard will provide more utility and greater quality control when sequencing mtDNA. Corroboration of the SRM results will provide assurance that any unknown DNA is also being amplified and sequenced correctly.

Mitochondrial DNA, Standard Reference Material, Forensic Identification

D25 An Overview on Crimes by Women in Turkey

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The goal of this research project is to determine the properties of women's crimes.

The crime is an action and behaviour tended to abolish and erode the existing social regulations secured legally. Crime is of a universal nature and has been in existence since the oldest epochs of history.

Social and psychological interferences have been increasing violence and crime potentiality. But, some other factors also play roles in the formation of crime. For this reason, the feeling of deprivation is an important factor. Learning is also another important factor in the formation of violence. Today, the fact that the violence is learned is a common concept. Beside the transfer of violence through inner-family violence, to become aware of violence by means of media is a common problem today.

Women are seen to be involved in crimes less than men in all societies when the relationship between gender and crime is considered.

The rate of female criminals differs from country to country and according to socio-cultural structure differences. There are similarities between male and female criminal tendencies, who belong to the same race and social class. The contents of crimes committed by men and women especially from the lower income groups are utterly identical.

When the crimes of women and men are compared, criminal women are expected to be psychologically more atypical because of their less aggressive nature compared to men. It is obvious that women tend to kill and injure mostly in order to defend themselves. Women generally commit crimes by themselves and do not participate in organized crimes. Women are generally in very close connection with the victims. The rate of crime is higher in married women depending on the problems of marital circumstances.

Women's crimes appear as an important legal and bio-psycho-social problem having many aspects such as inner-family violence, disintegration, and social collapse.

The study aimed to analyze the demographic characteristics, inner-family violence stories, and crime properties of the criminal women.

Between November 2000 and March 2001, we investigated women criminals sent to the Council of Forensic Medicine, 4th Specialization Committee (Forensic Psychiatry Department), the unique official referee under the Ministry of Justice, by the courts throughout the country, to determine if they have psychiatric disorders which affect their crime liability. In this sectional period, 64 women out of 84 sent by the relative courts, who accepted to participate in the study after being informed about the objectives of the study, were interviewed by face-to-face method and by means of a pre-prepared questionnaire having multi-questions. All interviews were conducted after juridical examinations.

Mean age of 64 participants was 35.51 ± 11.09 ; 26.6% of the women (n: 17) were illiterate and 53.1% were educated for five years; 59.4% of the cases (n: 38) were married; 75% were (n: 48) unemployed; 4.7% of them (n: 3) had previous crime records; 3.1% (n: 2) had been drunk during criminal incidents; 67.2% of total cases had inner-family violence stories; 62.5% physical and spiritual (n: 40) and 4.7% spiritual only (n: 3); physical and spiritual violence was realised by spouses only (58.1%) and the collaboration of spouses and parents (41.9%); women had pre-crime 35.9% (n: 23) and post-crime psychological disease stories 39.1% (n: 25); the committee agreed that 60.9% of the cases (n: 39) had "complete crime liabilities"; 48.4% of women committed homicide, 48.4% of which (n: 15) against husbands or lovers; 74.2% of them had complete crime liability and 71.0% had inner-family violence stories. There was no statistical significance to determine between their exposure to inner-family violence and their crime liabilities of women who murdered compared with other criminal women, ($p > 0.05$).

The most frequently used criminal tools were fire guns 26.6% (n: 17) and cutting and perforating tools 18.8% (n: 12). Murders were realized by fire guns at a rate of 48.4%.

In the USA, women executed only 12% of all murders. Most of them killed their partners who abused or violated them. It was postulated that every year about 750 men are killed by their wives, girlfriends or lovers and almost all killing women were beaten ones. The study emphasized that about half of the killing women had killed their husbands and lovers, which was very striking; this matter must be paid attention since all the women sent to our department for "murder liability" examination do not represent all criminal women.

The new role of the woman in the social economic life might be supposed to increase the crime rates of the women. With more and more women entering the workforce, new legal regulations are needed to define the socio-demographic properties of "women's crimes" and to support more adequately the criminal women and their families.

Female, Offender, Violence

D26 Prior Abuse Reported by Male Inmates in 17 Turkish Correctional Facilities

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The goal of this research project is to present to the forensic community the results of the most comprehensive survey of male inmates ever undertaken in this country.

Statistical data are provided on offender characteristics in seventeen correctional units under the jurisdiction of the Ministry of Justice, Department of Corrections on June 30, 2001. The Survey of Inmates in Correctional Facilities (SICF) designed by the Institute of Forensic Sciences of Istanbul University for the Department of Corrections was applied to nationally representative samples of inmates. Offenders responded to 323 questions in hour-long interviews about their current offense and sentence, criminal history, personal and family background, prior drug and alcohol use and treatment, past physical and sexual abuse. This paper presents findings from SICF of male correctional populations regarding relationship to abuser (by the inmate reporting abuse); relationship prisoner's prior abuse to their family background (nonparental care, parental drinking and drug abuse, incarcerated relative); association of past physical and/or sexual abuse with current and past violent offenses and past alcohol and illegal drug use. Descriptions of methodology, sample design, standard error calculations, question wording problems and respondent sensitivity will also be discussed.

Physical and Sexual Abuse, Survey of Prison Inmates, Prior Abuse - Crime Relationship

D27 Development of Personnel Portals That Detect Explosives and Other Contraband

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The goal of this research project is to update the forensic community on the development and testing of several personnel portals that can detect various explosives.

The Federal Aviation Administration (FAA) has funded several projects through the Aviation Security Research and Development Division that have resulted in the successful development of four personnel portals that could be used to screen airline passengers. These portals use a variety of techniques to collect trace amounts of particles and/or vapors from clothing that may have been contaminated due to an individual handling and/or concealing an improvised explosive device (IED). The collection varies from actually vacuuming the clothing while the passenger walks through the portal to sampling the 'thermal plume' generated from body heat. Air jets accomplish further enhancement of the collection process, which facilitates the dislodgement of particles. A critical part of the development was to preconcentrate the collected sample into a volume that was compatible with the detector. By way of example, the collected volume can be as much as 2000L and the maximum volume for one detector is less than 2mL.

After collection and preconcentration, the trace particles and/or vapors are analyzed by one of three detectors. The SecurScan (Thermedics Detection, Inc., Chelmsford, MA) utilizes a chemiluminescence detector coupled with a gas chromatographic column.

The Sentinel (Barringer Technologies, Inc., Warren, NJ) and the EntryScan3 (Ion Track Instruments, Inc., Wilmington, MA) utilize ion mobility spectrometers for detection; whereas, the Sandia/Syagen portal (Sandia National Laboratories, Albuquerque, NM; Syagen Technology, Inc. Tustin, CA) uses a dual ionization mass spectrometer. The Sentinel and the EntryScan3 are now commercially available by the manufacturers. All the portals are undergoing extensive testing and evaluation by the FAA's Trace Explosives Program.

Explosive, Portal, Aviation Security

D28 Development of Two New Quality Control Aids for Use With Airport-Deployed Trace Explosives Detection Equipment

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The goal of this presentation is to show the forensic science community recent progress in the development of quality control materials for assessing the performance of trace explosives detection systems deployed in domestic airports.

The Federal Aviation Administration (FAA) Aviation Security Research and Development Division has developed and evaluated two new Quality Control Aids (QCAs) for use with explosive trace detection (ETD) equipment that is currently in use at domestic airports. These QCAs are designed to assess two different components of ETD performance. The first QCA, referred to as the Instrument quality control (IQC), contains a known quantity of pure explosive dissolved in an alcohol matrix (isobutanol). The purpose of this product is to detect changes in detector sensitivity over time. Although various explosives have been tested, this presentation will discuss only the use of RDX (cyclonite). One drop of IQC solution is dispensed by means of a plastic dropper bottle directly onto the sampling media used by the respective ETD instruments. The drop is allowed to dry, and then the sampling medium is inserted directly into the ETD for analysis. Drops of IQC solution are shown to be reproducible and quantitative. Explosive concentrations are selected such that the ETD system gives a detector response of approximately 120% of the response expected from trace explosive contamination of passenger luggage. The IQC solution has been tested on six versions of ETD systems from three manufacturers. All are currently deployed in domestic airports. These systems include the Itemiser (DOS and Windows versions, Ion Track Instruments, Inc., Wilmington, MA), the Ionscan (Models 400 and 400B, Barringer Technologies, Inc., Warren, NJ), and the EGIS (Model 3000 and Model II, Thermedics Detection, Inc., Chelmsford, MA).

The second Quality Control Aid is called the System QC (SQC). This product is designed to challenge the quality of the entire testing process, to include the sampling skill of screening personnel employed at airport security checkpoints. This QCA differs from the IQC in that commercial or military grade explosives are used to prepare dissolved explosive solutions, instead of pure explosive compounds. In the case of plastic explosives, plasticizer and oil components are also present in the dissolved solutions in addition to the pure explosive component. The dissolved explosive is then deposited quantitatively on a small strip of Teflon sheet (Bytac) and allowed to dry. The Teflon sheet is then rubbed onto any suitable test article, such as a luggage handle, by a Dry Transfer technique (pat. pending). The test article is then sampled using the routine sampling protocol for that particular ETD system. Studies show transfer efficiencies from Teflon to test article of 90% or better. Concentrations chosen are higher than those used for the IQC to allow for greater variability in sampling. The System QC has been tested on all ETD systems described above.

The Quality Control Aids described here, when used together, are

intended to facilitate the increased use of accepted forensic laboratory practices in trace explosives detection.

Explosives, Trace Detection, Quality Control

D29 False Personation and Substitution of Laboratory Blood Samples Challenge Genetic Testing and Child Support Enforcement

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The goals of this research project are to present challenges of identifying fraudulent results that were the product of criminal conspiracy and substitution of laboratory blood samples during DNA paternity testing and resultant criminal penalties. This presentation will demonstrate the discovery, investigation, and identification of fraudulent blood sampling and personation during genetic paternity testing, resulting in criminal penalties and on-going child support.

Nationwide, establishment of paternity and collection of court ordered child support is a billion dollar undertaking mandated by federal and state law. Government agencies at the local, state, and federal level strive to collect child support from non-custodial parents in order to provide necessities of life for minor children. Complex legal issues and family emotions present a highly charged atmosphere with potential for costly, and sometimes violent, ramifications. While statistics indicate that the majority of non-custodial parents willingly comply with child support issues, there are those people who will do anything and everything to evade, avoid, and otherwise fail to comply with such support responsibilities. These efforts sometimes involve criminal activity, and the exact number of these cases is unknown. The widespread impact of this is felt by families, social service agencies, and taxpayers.

In California, the local district attorney offices have been at the forefront of these efforts. Child support enforcement divisions are most often separate from the criminal divisions and are staffed by family support officers, attorneys, and trained criminal investigators.

When a member of the U.S. military was declared by a custodial mother to be the father of a two-year old child, a routine genetic test was ordered. Unexpectedly, the results were exclusionary. A photograph of the alleged biological father, taken at the time of the blood draw, was identified by the mother as the correct person. Other men outside the time frame of conception were subsequently located and tested, also with negative results. Investigative interviews and fingerprint identification led a veteran criminal investigator to conclude that a personator had been substituted.

With the cooperation of military authorities, the location of the reputed father was quickly determined. He had threatened the young mother and then transferred across the country shortly after learning she was pregnant. However, the identity of the suspect who furnished blood remained a mystery. Strong cooperation between civilian and military enforcement personnel ultimately established the unknown. Through the quiet involvement of unit commanders, investigators learned the source of blood was another member of the suspect's unit. Unlike many other personator cases, this subject bore an uncanny resemblance to the declared father. Crossing the nation, the investigator obtained partial admissions from the true father and an uncontaminated blood sample. Returning to the west coast, a total confession was obtained from the blood donor, a man in the final stages of application for employment as a police officer. The supervised blood sample taken from the named biological father

confirmed paternity. The result was on-going collection of child support and two criminal convictions.

Fraudulent Blood Samples, Impersonation, Child Support

D30 Forensic Science and Forensic Mythology: Making the Distinction

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The goals of this research project are to examine the current standards of acceptability for proven forensic science methods and unproven, traditional methods that are commonly accepted as being valid. The latter methods may be placed under the classification of "forensic mythology," and the present paper aims to trace their origins in popular media and common misconceptions about science, as well as to examine what effect forensic mythology continues to have on our legal system. The author proposes an intellectual standard for the assessment of forensic science techniques in order to enhance the efficacy of the existing judicial standards.

Ever since the District of Columbia Court of Appeals issued the *Frye* decision of 1923, forensic scientists have been charged with the responsibility of proving that their scientific evidence meets a certain standard of credibility before it may be admitted into court. While the *Frye* standard served as a solid benchmark for expert testimony until the U.S. Supreme Court's *Daubert* decision of 1993, it did not completely block the admission of pseudoscientific and unreliable testimony from the courts, nor has the *Daubert* standard strengthened the barrier against bad science in the courtroom. Some would argue that the *Daubert* decision was a step backward in this regard. In addition, both the *Frye* and *Daubert* rulings have had no effect on the scientifically unfounded forensic techniques used by authorities to identify suspects, elicit confessions, jog the memories of witnesses, and weed out undesirable potential employees. Indeed, the so-called "lie detector," which the *Frye* court deemed unscientific and inadmissible as evidence, has recently shown an upsurge in use by state and federal agencies, as well as by private companies. If the lie detector, along with other such scientifically unfounded forensic techniques as hypnosis, criminal profiling, psycholinguistics, and eyewitness identification do not meet the standards for validity that would be demanded in any other scientific field, the questions must be asked: Why are these techniques still being used, and why is our legal system so ineffectual at blocking bad science from the courtroom?

The endurance of pseudoscience applied to forensic ends may be partly to blame on the popular misconceptions of forensic science that are perpetuated through popular entertainment as well as highly-publicized historic criminal cases that have taken on an aura of legend. Of particular importance is the longevity of Arthur Conan Doyle's fictional character Sherlock Holmes, who provided the public with an archetype of the forensic investigator as highly rational, scientifically methodical, keenly observant of detail, and ultimately infallible. The popular conceptions of forensic science echo the popular misconceptions of science as a whole. While many lay persons may believe, erroneously, that science is always objective and infallible, a large portion of Americans simultaneously accept as true such blatantly false techniques such as astrology and mind reading. The unfortunate overall picture of America's scientific literacy is that of a population largely lacking the educational background and the intellectual skills to be able to discriminate between credible science and scientific-looking chicanery. Because most attorneys, judges, and jurors are scientifically lay persons, the American legal system is by extension dangerously vulnerable to the lures of *scientism*, that is, unproven methods that are cloaked in the mantle of scientific-sounding jargon and impressive-looking data. All of these factors contribute to the

perpetuation of a forensic mythology, by which the perceived truths of forensic science are accepted on faith and passed on through tradition, rather than scrutinized and repeatedly tested.

If forensic science as a whole is to be elevated from the mire of mythology, it is the responsibility of each forensic researcher and expert witness to set an example through his or her professional conduct. The only intellectually honest position to take as a professional in the forensic sciences is one of perpetual skepticism, always demanding that the reliability of forensic techniques be tested, and always ready to disclose a technique's fallibility.

Admissibility, Mythology, Skepticism

D31 Integrating Forensics Into Nursing Curricula

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The goal of this research project is to acquaint those involved with forensic education of ways to promote and integrate forensic concepts into a baccalaureate nursing curriculum.

This presentation will address how the mission and philosophy of the college or university and the demographics of the community that the college serves are utilized to justify integrating forensic concepts into the nursing curriculum.

In the past, curriculum content has been based upon the ten leading causes of death in the U.S, the major health problems of the United States; the major health problems of various age groups throughout the life span, and other strategies. With the preponderance of violence in today's society, forensic considerations of interpersonal violence, suicide, trauma, sexual assault, substance abuse, toxicity from accidental prescription and O-T-C drug use and misuse, and environmental poisoning are but a few examples where the forensic sciences have much to contribute. Proper wound identification, evidence recognition and collection in the clinical setting, proper written and photographic documentation that withstands courtroom scrutiny, recognition of primary and secondary crime scenes which patients may present, prevention techniques of document alteration (patient records) are important subjects with which the nurse should be acquainted in this litigious society. A nurse is educated to look beyond what meets the eye, and a basic understanding of selected forensic concepts will improve the recognition and collection of evidence and data of patients and their significant others. Documentation of these findings may be crucial if those patients and their significant others later interact with the criminal justice system.

The nursing curriculum is already overloaded with content, and faculty may not consider that coverage of this content can be in few-minute segments as it is integrated into various nursing courses. For example, when wound care is discussed, forensic wound terminology can be introduced. When learning physical assessment, the forensic implications of carefully documenting suspicious lesions or wounding which might create an index of suspicion as to their cause can be emphasized. This would include obtaining the history of how these wounds were incurred according to the patient. In pharmacology, actual cases histories of accidental poisoning with one or interacting drugs can impress the student with the vital need to elicit patients' histories and patterns of consumption. The pathophysiology of drug abuse and misuse can be included in pharmacology and/or mental health nursing. How much more exciting and pertinent to have a document examiner describe and display how changed or forged documents are detected than to just emphasize proper documentation techniques with their medicolegal implications. These and other examples of how specific content can be integrated into nursing

courses will be included in this presentation.

If no forensically-trained faculty are available, content selection and integration assistance can be elicited from forensic clinical nurse specialists, forensic pathologists, toxicologists, criminalists, questioned documents examiners and other forensic scientists. A list of applicable commercially available videotapes will be distributed.

Nursing Education, Nursing Curricula, Forensic Concepts Integration

D32 A Cross-National Comparison of Selected Police Investigative Support Services in the United States and South Korea

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The goal of this research project is to report the preliminary findings of a cross-national assessment, including the United States and South Korea, of the police criminal investigation process.

Criminal investigation is a core component of the general police mission. How effectively it is carried out is strongly related to the overall performance of criminal justice systems and the institutions in those systems. For example, prosecutorial decision-making depends, in large part, on information resulting from police investigative activities. Courtroom proceedings, and even court sentencing practices, are influenced by the presence of evidence collected by the police; the availability of certain physical evidence has been shown to increase both the likelihood and length of incarceration. Of course, police investigation activities also influence the nature and volume of the workload in crime laboratories. Police investigation, in short, is the essential gateway to crime laboratory, prosecution and court activities, all of which, in turn, drive prison populations.

In spite of this importance, there has been surprisingly little scientific inquiry regarding the police investigative function. The overwhelming bulk of research attention focused on policing in the past 30 years has concentrated on police patrol and service activities. In fact, a recent content analysis of the research articles published in major criminal justice and criminology journals revealed that less than 2% of those were devoted to police investigation (Horvath, Lee, & Meesig, unpublished manuscript). For that reason, little reliable information is available in the United States about such topics as investigative policies, practices and effectiveness and how those interact with support services, such as crime laboratory personnel and activities. Of course, assessing differences in the police investigative function between countries is a much less empirically explored area. It is that topic to which this paper is devoted. In this paper we consider selected issues regarding forensic services for police investigators and we discuss how these are related to police investigation in two different countries, South Korea and the United States.

In South Korea, the justice system is considered to be primarily of the inquisitorial type. In such systems, forensic science laboratory services are often provided by large university-based medico-legal institutes or separate national forensic laboratories which assist the court (as well as the police) in determining "truth." In the United States, where the adversarial legal tradition is prevalent, crime laboratories are commonly appended to police organizations. Forensic services therefore are not uniformly provided and, perhaps, in part, for that reason, are sometimes matters of dispute between the prosecution and defense. Both the relevancy and reliability of scientific tests may be at issue during criminal proceedings and, at times, the outcome may depend on the prevailing view of such tests.

In addition to how their Criminal Justice Systems differ, in general, Korea and the United States also differ considerably with respect to the organization of their police. One of the peculiar features of law enforcement agencies in the United States is how decentralized they are; there are more than 18,000 separate, autonomous police departments.

Similarly, crime laboratories in the U.S. provide services in a very decentralized way, according to their diversified local situation. Some laboratories, organizationally attached to local police departments, provide almost exclusive forensic services for such departments. Other laboratories, often those affiliated with a state or federal organization, provide services to police agencies unable to afford either their own laboratory or specific forensic techniques. In contrast, the Korean police, a National police force, have one centralized national crime laboratory system. That system and its services, attached to the Ministry of Interior in South Korea, are nationally administered and managed; importantly, the crime laboratory is, in principle, separated from the police organization.

In this study, we carried out mail surveys of representative samples of law enforcement agencies in the United States and South Korea. For the U. S. sample we surveyed 3,124 police agencies; the sample included all of those with over 100 sworn employees, all state police agencies, and a representative sample of smaller municipal agencies. The response rate was 56% (n= 1,746). For the South Korean sample, all police departments (actually separate sites of the National police organization) in the country were included in the sample; the response rate was 97% (n= 224). In both countries, the data collection instrument included items addressing five general areas of interest: the work and role of investigators, the work and role of patrol officers as they relate to investigations, investigative management, investigative effectiveness, and, investigative support units, including certain forensic services.

The purpose of this paper is twofold. The first is to identify similarities and differences between the two countries with respect to four issues: (1) police evaluation of crime laboratory services; (2) requirements for and use of evidence technicians; (3) perceptions of funding needs for enhancing investigative effectiveness; and, (4) the role of patrol officers in investigations.

Our second purpose is to contrast, in terms of investigative policies and practices, police agencies in the U. S. who do not have their own crime laboratory with those who do. Since this is not a concern in South Korea, that contrast was explored in an effort to shed light on differences between South Korea and the U.S. in terms of general investigative practices.

The differences in the crime laboratory systems in the two countries suggest that there may also be differences in how the services of those systems are viewed. On this issue, our preliminary findings show that a greater percentage of the police in the U. S., 24%, report a "timely" turn-around time for crime laboratory services than those in South Korea, 12%. However, a large proportion of police agencies in both countries evaluated turn-around service in crime laboratories as "somewhat slow," 49% in the U. S. and 72% in South Korea. Such service in both countries was almost equally considered completely inadequate, 3% in the U. S. and 1% in South Korea. In other words, although the countries differ in important respects, evaluation of support services for investigation is less than positive in spite of those differences.

With respect to the use of evidence technicians, more American police departments (89%) require specialized experience or training than is true in South Korea (72%). (We note here that in spite of the apparent uniformity of policy and practice across South Korea, in some instances, such as with respect to evidence technicians, geographic and other jurisdictional disparities permit local needs to prevail.) Perceived funding needs in the U. S. were primarily for investigative personnel (42%), whereas in South Korea investigative operations (63%), that is, the need for funds to execute investigations, was the predominant view. Similarly, the South Korean police expressed a greater need for funding (55%) of evidence processing than did their American counterparts (11%). South Korean patrol officers' evidence collection activities at crime scenes were only slightly more frequent than for their American counterparts. In 20% of their cases, South Korean patrol officers always collect evidence from crime scenes whereas 17% of American officers do. With respect to submission of collected evidence for forensic analysis, South Korean police officers make such submissions in 23% of their cases whereas only 15% of American officers do.

In an effort to explore some of the differences between the investigative process in the U. S. and South Korea, multivariate analysis was carried out. This analysis, conducted initially to identify those variables most influential in explaining differences between police agencies in the U.S. who have their own crime laboratory facility from those who do not, showed that those police agencies with their own laboratory were more likely to employ evidence technicians, had more timely crime laboratory service, and made use of specialized investigative units (e.g., task forces), after controlling for jurisdictional size. However, investigative productivity and easier access to laboratory services were not related to police ownership of the laboratory.

Other findings related to differences between the U. S. and South Korea, their meaning for the police investigative function in general and, more specifically, with regard to their value in understanding police investigative activities in the context of different organizational, legal, and social environments, will be presented in this paper. We will conclude our presentation by focusing on the effect of contextual differences on investigative outcomes, particularly case clearances, and productivity.

Criminal Investigation, Police Investigation, Cross-National Investigations

D33 The Effect of Prior Knowledge, Practice, and Countermeasure on the Accuracy of Control Question Testing

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The goals of this research project are to gain knowledge in the current literature about the effect of countermeasures on the results of polygraph testing using the Control Question Technique (CQT), the most common approach to "lie detection" in the U.S. The preliminary results from an ongoing study will be used to indicate gaps in the current knowledge base in this area.

When polygraph testing is carried out using the CQT, a subject's physiological responses to a set of "control" questions and a set of relevant (crime related) questions are compared in order to determine the subject's truthfulness. Simply stated, more consistent and pronounced responses to control questions than to relevant questions leads to a decision of truthfulness; whereas, consistently greater responses to relevant than to control questions will produce a decision of deception. Persons who are lying about relevant questions, however, may employ countermeasures during a CQT; that is, they try to "beat the test." This can be done in one of two ways. First, physiological responses to relevant questions may be suppressed, relative to control question responses. Second, physiological responses to control questions may be "artificially" enhanced. In either instance, the result is intended to show greater responses to the control than to the relevant questions in order to change the outcome from a "deception indicated" one to a "no deception" indicated result, what is termed a false negative outcome or an actually deceptive person reported as truthful.

The effectiveness of countermeasures on CQT outcomes is not well established. Laboratory, "mock crime," studies reported to date have examined the effect of a number of mental and physical countermeasures. In one study, Honts (1986) reported that 37 % of the "guilty" subjects who were trained to use either pain or another physical countermeasure, or both, were able to defeat the CQT. In addition, 25% of the guilty subjects in this study, who were specifically trained in the use of a cognitive countermeasure were also able to defeat the CQT. In an earlier study, however, Dawson (1980) reported that guilty subjects who were trained in the use of a "method acting" procedure were unable to alter the outcome of their CQT examination. In his study, all "guilty" subjects were correctly detected. The reason for the difference in findings between the

two studies may be that the guilty subjects in Dawson's study did not have prior practice sessions as was the case in the Hont's study.

Rovner (1979) and Honts, Hodes & Raskin (1985) have reported additional countermeasure studies. Rovner found that the false negative and inconclusive rates among guilty subjects who were given detailed information and practice were significantly higher than those rates among guilty subjects who were given either no or some information about the CQT without practice. The Honts, Hodes & Raskin study showed that untrained guilty subjects using spontaneous countermeasures did not affect the outcome of the CQT. However, in a follow up study, subjects trained in the use of physical countermeasures were able to produce a much higher rate of false negative outcomes (47%) as compared to subjects in the guilty control group (0%).

Aside from studying the effectiveness of countermeasures, research also has been conducted to determine if, and how well, countermeasure attempts can be detected. This research suggests that attempts to detect the use of physical countermeasure by means of additional sensors (e.g., Electromyographic recordings) may be of limited value. Even if such sensors were effective, it is perhaps unlikely that they would be useful in detecting mental as opposed to physical countermeasures. Furthermore, there is some research which shows that the use of a test question, included in the testing protocol, to detect countermeasure attempts may not be of value.

Considered together, the available laboratory studies suggest that "guilty" subjects may avoid detection with the CQT if they have specific prior knowledge of the testing conditions and, importantly, if they are given intensive practice in applying countermeasure maneuvers. This is, of course, a concern in the polygraph examiner community. And, it is seemingly even more important today. There are now many sites on the World Wide Web accessible to anyone with a computer which post considerable information about polygraph testing and the CQT, in general, and about countermeasure usage in particular. In fact, there is at least one location which provides, at some cost, printed material detailing methods that may be used to defeat a polygraph examination.

The vast amount of information available about polygraph testing, the suggestion that some countermeasure usage may be difficult to detect, and the widespread use of the CQT show that it is important to carry out additional research. The design and intent of some of that research, along with the preliminary results of an ongoing study, will be discussed in this presentation. We will also highlight the features of the research which are different from what has already been reported and we will consider the remaining gaps in our knowledge of this issue.

Polygraph Testing, Countermeasures, Control Question Testing

D34 Servant Leadership in a Forensic Setting

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The goals of this research project are to study the proliferation of books on leadership and leadership styles, this paper will present an oft-misunderstood means of leadership that has the advantages of promoting morale and personal and professional growth within a typically high stress environment such as a forensic laboratory.

Servant leadership is a leadership style in which, "the great leader is seen as servant first, and that simple fact is the key to his greatness." (Robert Greenleaf, *Servant Leadership*, New York: Paulist Press, 1991, 7.) Robert Greenleaf, a former executive at AT&T has espoused servant leadership as the leadership style that will build morale, allow opportunities for personal and professional growth, and allow all individuals within a workplace to have the opportunity to reach their potential.

The concept of servant leadership is a difficult one to articulate because the common meanings of the individual words appear to be

incompatible when used together. Some may even consider the term to be an oxymoron. However, when viewed in their proper context the term servant leadership is best viewed as a tension to be kept in balance.

In order to keep this tension in balance, one must have an appropriate view of servanthood and leadership. In its simplest form, servanthood is neither a weakness nor a lesser position. Rather, servanthood is an opportunity to provide an individual with the means through which he or she will be able to accomplish a specific task, or a continuing set of tasks. It involves the provision of tools, both tangible and intangible, that allows an individual or group of individuals to successfully complete the task(s) set before them. Leadership is best seen not as an opportunity to wield authority, but an opportunity to work with a group of individuals for the purpose of teaching and mentoring them so that they can find their niche within an organization and grow to their fullest potential within that organization.

The complicating factor in all this is that such a leadership style is not particularly advocated within law enforcement organizations, of which most forensic settings are a part. Law enforcement agencies are typically militaristic in their leadership style primarily because of the tasks in which they take part. Unfortunately, when such organizations offer training classes to their managers and supervisors, there is little distinction made between leadership styles and methods that are effective for street officers and those that would be effective for civilians working in a different environment. Yet, it is the forensic setting in which servant leadership can have a tremendous impact.

One of the chief advantages for effective servant leadership in a forensic setting is the tremendous boost in morale and interpersonal relationships not only among peers, but also between managers and staff. This is not to be taken lightly because one of the chief concerns among staff is that managers either do not have an understanding of their situation or they are non-responsive and do not listen well. Forensic managers have generally attained those positions because, at least in part, they have served a length of service within an organization. Generally, they have survived throughout that period, at least in part, because, working in a law enforcement organization, they have been told to regularly detach from unpleasant circumstances, lest they be adversely affected. Unfortunately, it is not so easy to reattach later on in one's career. Far too often, managers have become so adept at detaching from circumstances that they also detach from people and their circumstances as well. Effective servant leadership is a way in which managers can successfully reattach to their people, recognize and validate the feelings and emotions they have when they encounter a particularly unpleasant situation, and teach them coping mechanisms so that the situation can be dealt with and appropriately dissipated over time.

Another advantage of servant leadership is the promotion of personal and professional growth of individuals within an organization. In contemporary society, it is critical that managers recognize that their employees have a significant life outside of work. In addition, many of these individuals are inexperienced in methods of trying to reconcile seemingly conflicting needs, schedules and priorities. A laboratory manager is in position to effectively help those for whom they are responsible to learn how to prioritize and adjust their schedules so that there is ample opportunity for personal and professional fulfillment. In addition, laboratory managers are in position to effectively find means to promote the professional growth of those under their charge, helping them to grow to their fullest potential through recognizing their strengths and building upon those without regard for position or status within the laboratory. An effective servant leader has the ability to discern needs because he or she communicates effectively and often. An effective servant leader also recognizes that personal and professional fulfillment are not in conflict with one another, but absolutely vital to the continued health of an organization.

Forensic Laboratories, Management, Servant Leadership

D35 The Dynamics of Human Movement in Shooting Incidents

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The goal of this research project is to have participants become familiar with how the dynamic elements can affect the reconstruction and analysis of shooting incidents.

This presentation will discuss the results of research and experimentation in the dynamics of shooting incidents including the time intervals of rapidly fired shots; the muzzle-to-target bullet travel time; the minimum and other time intervals required for a human to fall from standing to prone positions; the time required for body rotation; human reaction time; and, other related elements which affect the analysis and reconstruction of shooting incidents.

The experimental methodology included the use of high-speed and frame-by-frame video analysis which allows slow motion and stop action review of fast events and accurate time correlations to be determined.

Most shooting incidents include movement by victims. The author has been involved in several cases in which movement by a person just prior to and during the shooting event has caused confusion and misinterpretation relating to the initial position, stance, and orientation of the person shot.

Two situations occur frequently which require an understanding of shooting dynamics for an accurate reconstruction:

* A person who has made a deadly force threat against another person will be shot sequentially as he falls to the ground. Under currently used doctrines on the use of deadly force by law enforcement officers, it is permissible to continue to shoot until the person is clearly no longer a threat to the officers or to others. During the interval between the first shot to the last, the person being shot will often not fall directly from a standing position to a prone position. More common is a crumpling fall that can require several seconds (or more) during which time many shots can be fired. The number of shots and the placement of wounds can lead to a superficial analysis of the incident concluding that an excessive number of shots was fired and/or the misperception that the person was shot in the back while standing.

* Two people (A and B) face each other, both are armed. A perceives a threat by B and he reacts by drawing, aiming, and firing his weapon at B. While B was facing A at the initial moment, B has recognized A's initial movements and he has started to make a defensive movement, i.e., to turn away from A. By the time A has completed all the elements required to discharge his weapon, B has rotated at least partially. The bullet strikes B behind the coronal plane – "in the back" — and A's account of the event is erroneously determined to be inconsistent with B's wounds.

The author's findings from human movement experiments established typical minimum time for the fast rotation of a person's body, time of falling, minimum time for shooters to react and fire a weapon, maximum rate of fire for common handguns, and typical bullet travel time.

The author believes that an accurate reconstruction of shooting incidents requires a broad understanding of all the significant dynamic events involved and the knowledge of fundamental ballistic and physical phenomena which do not support the common misconceptions that a bullet can knock a person down or cause the rotation or "spin" of an adult body. Another misconception is that a shooter will or should have the ability to know if his bullets have actually struck the person he is shooting at or that large amounts of blood will be immediately visible at the point of bullet entry. This paper will also discuss and demonstrate the fallacy of these beliefs.

Shooting Reconstruction, Reaction, Ballistics

D36 Child Homicides in the United States Air Force, 1989 – 1999

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The goal of this research project is to better understand the demographic and situational factors that pertain to child homicides associated with the United States Air Force.

The United States has the highest rates of childhood homicide and firearm-related death among industrialized countries (Centers for Disease Control, 1997). According to the Uniform Crime Reports published by the Federal Bureau of Investigation, over 1,400 children under the age of 18 were victims of homicide in 1999. Of all persons murdered in 1997, 33% of them were under six years old (Snyder & Sickmund, 1999). The United States Department of Health and Human Services (1999) found that children younger than one year old accounted for 42.6 percent of all abuse related child fatalities, and children younger than six years of age accounted for 86.1 percent of all child fatalities. As laboratory and diagnostic techniques have improved with technology, many deaths once thought to be accidentally or naturally caused have been re-categorized as homicides. Since these deaths often become targets of media publicity and public scrutiny, child homicides have begun to be studied in more detail. For instance, several researchers have identified head trauma and asphyxia as common causes of non-accidental child death. Other studies have identified that most children are not likely to be killed by strangers, but by people who know and care for them. In addition, child deaths are often intentionally presented with misleading or false histories that can confuse initial medical diagnoses, criminal investigations, and prosecution.

The United States military is a unique subset of the larger American population. Many selection factors make it unrepresentative of the American society at large. The US military employs screening systems to preclude entry of certain groups of people (e.g., repeat felons, mentally disturbed persons, etc.). In addition, military families have access to free or heavily subsidized health care from an entity who is not only a care provider, but also an employer, prosecutor, and in some cases, warden. What's more, military families are generally more mobile than their civilian counterparts, and therefore tend to establish more transient social support systems. Few studies address household mobility as it potentially relates to child abuse, and the studies that do exist provide conflicting data (Anderson et. al., 1983, Myers, 1970, and Schloesser et. al., 1992). During a review of the literature, the authors found very few studies that examined the military community exclusively as a separate entity.

In this paper, the authors describe an ongoing research project developed to better understand the interaction of the many demographic and situational factors that contributed to the murders of children who had an association with members of the United States Air Force. This project was undertaken to extend the findings of Brewster, Nelson, Hymel, et al, (1998), who described 32 Air Force-related infanticides (children under one year of age) occurring between 1989 and 1995. That study found that the infant-victim was likely to have a history of physical abuse, exhibit colic-like behavior, and was about five months old at the time of death. The caretaker-perpetrator in those cases was most likely the biological father. The most common scenario involved the male caretaker being left alone with a crying infant in the home on the weekend.

The authors of the present study will present an analysis of child homicides perpetrated worldwide and investigated by the US Air Force Office of Special Investigations (AFOSI) during a ten-year period (1989-1999). Three hundred fifty three cases involving the death of at least one child, five years of age or younger, were initially identified through the agency's investigative database. Cases were then further screened to identify homicide cases where one or more perpetrators were charged with

acts that demonstrated intent to fatally harm the victims. Cases were also included where the child's murder was a component in an overall homicide-suicide scenario. Over thirty factors were extracted from each incident's report of investigation to better understand the victims, perpetrators, families and commonalities present in the cases. The statistical analysis of the child homicides and potential points for possible intervention and prevention will be presented.

Child Homicide, United States Military, Death Investigations

D37 Imaging the Unimaginable: Radiology's Reluctant Recognition of Child Abuse

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The goal of this research project is to present the peculiar history of the delayed recognition of child abuse as a clinical entity, a lesson in the scientific consequence of non-objectivity and culture-based mind-set.

Practically every application of radiology in the forensic sciences had been accomplished or proposed within one year of Röntgen's discovery. The greatest exception is perhaps also radiology's greatest contribution to this field, the recognition and awakening of public consciousness to the heretofore unimaginable evil of deliberate injury of children by their caregivers. This took half a century and the reluctant conclusions of a compassionate pediatrician cum radiologist. The very concept of child abuse is modern, not rooted in our ancient culture in which parental power over the child was absolute.

The industrial revolution with its insatiable appetite for cheap labor, and the social excesses attendant to child labor, did stimulate the social concerns of Dickens and a handful of other writers. It was only after successful argument that children really were but animals that a Society of Prevention of Cruelty to Children could be established in the United States — under the aegis of The Society for Prevention of Cruelty to Animals.

In 1860, Ambrose Tardieu, a French pathologist specializing in public health and legal medicine, published an article (republished 19 years later) describing all of the salient features of child abuse (except for the radiologic). Tardieu, unfortunately, seems to have stirred the interests of modern historians far more that those of his contemporaries and the entity remained largely unrecognized.

In the 1930's John Caffey, a pediatric radiologist at Babies Hospital in New York City, began to notice and collect patients with an unusual concatenation of findings: chronic subdural hematoma and multiple fractures in different stages of healing. (The unarguable opinion of a famous pathologist, Virchow, had obscured and delayed the recognition of the traumatic origin of subdural hematomas for 70 years).

In this, and subsequent papers, Caffey described the entire radiologic spectrum of child abuse which will be illustrated. Finally and reluctantly, he and his disciples and colleagues, including the pediatrician Kempe and social workers, defined child abuse holistically as both a socio-economic and medico-legal problem.

This sad history of delay and missed opportunity does not end with child abuse. It was three decades after Caffey's work before the publication of a paper describing almost identical medical findings and social histories on "granny battering," abuse of the elderly. Still later we have come to recognize spousal abuse or abuse of intimate partners as a problem whose victims exceed child abuse in numbers.

Child Abuse, Radiology, History

D38 Recognition of Child Abuse

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The goals of this research project are to recognize bite mark evidence. Participants will learn the proper handling of bite mark evidence in order to facilitate the forensic dentist's work and to minimize potential problems. Issues of photography, lifting of the tissue, fixation, preservation, transportation and transillumination will be reviewed. The importance of preserving the excised tissue without sectioning will be demonstrated. The analysis of the evidence and the pertinence of computer software programs will be mentioned. Cooperation and communication between forensic pathologist and dentist will be emphasized.

A two and a half month old white male was found to have contusions on the face and shoulder with a barely perceptible patterned injury on the abdomen. The skin superior to the umbilicus was excised, fixed and preserved. The transilluminated specimen showed two distinct bite marks of human origin. The interpretation of the patterned injury could not have been elucidated without the use of this technique.

A five-month-old black male was admitted to the emergency room unconscious with cerebral edema. The child was diagnosed with multiple non-depressed comminuted bilateral skull fractures, and with a mildly displaced mid shaft fracture of the right clavicle. The examining physician noted contusions of recent origin on the legs, arms, abdomen, chest, back, neck, left and right cheeks, and left heel. Despite initiating emergency treatment, the child died three days later. Although the bite mark was accurately identified at autopsy, odontological analysis was hampered by a lack of properly scaled photographs and unsuitably preserved tissue.

A fourteen-month-old white male was found lifeless in bed. The child was pronounced dead, his body embalmed. Suspecting child abuse, burial was halted, and an autopsy ordered. The autopsy attributed death to asphyxia by suffocation. Though there was no evidence of trauma to the hyoid bone or thyroid region, the pathologist noted multiple blunt traumatic injuries to the head, trunk and extremities in various stages of healing. The right humerus and left tibia were fractured, and there was edema of the cerebrum and occipital lobe. Most of the anterior teeth had erupted, and the lips, cheeks, and frenulum were bruised. Head shaving revealed a contusion over several areas of the head. Retraction of the scalp confirmed the presence of arch-shaped hemorrhages consistent with bite marks of human origin. The analysis of this case was restricted by improperly scaled photographs and because the bite mark tissue was not preserved.

A seven-year-old girl was found dead and mutilated in her basement. Her mother was charged with second-degree murder and denied bail. The pathologist attributed the cause of death to more than eighty stab wounds created by scissors and/or knives. The defense maintained that the injuries were caused by animal bite marks.

Bite Mark Recognition, Bite Mark Photography, Bite Mark Fixation