



WORKSHOP ABSTRACTS

May 7-10, 2019 - Morgantown, WV

BIOLOGY SECTION WORKSHOPS

(W1) Forensic Genealogy: A Powerful Solution

Presented by Melinde Lutz Byrne, FASG and Barbara Rae-Venter, Ph. D., Bode Technology
Full Day Workshop - Tuesday, May 7 (Member \$150, Non-Members \$200)

Using autosomal SNP data, genealogists have solved questions of identity for more than a decade. See how this is used in cold cases for law enforcement. A beginning screening process used by professionals will be reviewed and hands-on experience with charts will be provided.

(W2) Advanced Topics in DNA Analysis: Mitochondrial DNA from Sanger Sequencing to High Throughput sequencing (MPS, HTS) and High Throughput sequence analysis of mtDNA, STR/YSTR/SNPs (Wednesday AM)

Presented by Teresa Snyder-Leiby, Gloria Dimick, John McGuigan, Softgenetics, LLC (MAAFS Vendor)

Half Day Workshop - Wednesday, May 8 - Morning (Member \$100/Non-Member \$150)

The importance of mitochondrial DNA analysis as a forensic tool cannot be overstated. The natural DNA degradation process that occurs at death can be exponentially accelerated when bodies are exposed to harsh environmental conditions. For highly degraded, environmentally challenged and/or minimal samples, mitochondrial DNA analysis provides the last opportunity to gain any DNA information. This half-day workshop will begin with a presentation of the benefits and common misconceptions regarding mitochondrial DNA. The presentation will provide an overview of the key differences between nuclear and mitochondrial DNA, as well as appropriateness of sample types for testing. Lastly, an overview of cases will be provided to showcase the power of this tiny genome.

The High-Throughput sequencing portion of the workshop will cover:

1) An overview of the instrumentation and chemistry for high throughput sequencing (HTS, also referred to as MPS, massively parallel sequencing).

- 2) Discussion on mtDNA forensic alignment considerations and overall approach for analysis of mtDNA.
- 3) Advantages of deep-sequencing (including detection of heteroplasmy in mtDNA and isoalleles in STR data).

The last portion of the workshop will include hands-on analysis of demonstration data generated from a PowerSeq chemistry and separated on a MiSeq instrument. Demonstration data includes; mtDNA genome data, control region mtDNA, and STR/YSTR data used in a concordance test with capillary electrophoresis results. A limited number of PC laptops will be available for workshop participants. In addition, time-limited trial software (GeneMarkerHTS) will be available for participants who can bring their own PC laptop to the workshop.

(W3) Advanced Topics in DNA Analysis: Continuous Probabilistic Genotyping (Wednesday PM)

Presented by Teresa Snyder-Leiby, Gloria Dimick, John McGuigan, Softgenetics, LLC (MAAFS Vendor)

Half Day Workshop - Wednesday, May 8 - Afternoon (Member \$100/Non-Member \$150)

This half-day workshop will start with an introduction to probabilistic analysis, and will provide a summary of Probabilistic Genotyping Criteria from the SWGDAM Guidelines for the Validation of Probabilistic Genotyping Systems. There will also be an overview of how probabilistic genotyping makes use of data information, such as peak height, stutter, drop-in/out, and degradation to determine a table of weighted genotypes using the Markov Chain Monte Carlo (MCMC) approach.

Following a break, participants will work on a paper exercise calculating likelihood ratio (LR) from weighted genotypes and use the verbal scale from the *DOJ Uniform Language for Testimony and Reports for Forensic Autosomal DNA Examinations using Probabilistic Genotyping Systems* (2018). Using MaSTR Continuous Probabilistic Mixture Analysis software, the presenters will walk through how to use typical laboratory sensitivity and stutter study data to customize analysis of mixtures generated per their SOP and setting up analyses for mixtures with 2 – 5 contributors. A limited number of laptop computers with MaSTR probabilistic mixture analysis software will be available for participants to analyze demonstration data mixtures during this section of the workshop. In addition, time-limited trials of the software will be available for participants who would like to use their personal laptops for this portion of the workshop [Minimum computer spec requirements (complex mixtures may not run) = 4-core CPU, 16 GB of RAM, 1 TB hard drive, VirtualBox installed].

WORKSHOPS OPEN TO ALL SECTIONS

(W4) Ethics in Forensic Science

Presented by Robin Bowen, West Virginia University

Half Day Workshop - Tuesday, May 7 - Morning (Member \$100/Non-Member \$150)

Ethics is an understudied, yet significant topic when it comes to the field of forensic science. Although people may think of ethics as a personal matter, it also includes professional and public issues. Proper ethical behavior is required by scientists making complex decisions about the interpretation of data, about which problems to pursue, and about when to conclude an experiment, all which help to improve the quality of forensic science.

While the workshop includes many “basics,” the course relates those ideas to the forensic science profession. To understand forensic-specific ethics, it is important to look at the interactions between the cultures of science, law, research, and law enforcement. This workshop will provide attendees with an understanding of:

- how law enforcement approaches ethics
- ethical concerns of the expert witness
- why science is naturally an ethical field
- conflicts of interest and other potential problems
- where people get into ethical turmoil

The Ethics in FS workshop will be broken into lecture and interactive group activities. Attendees are given the opportunity to interact and discuss ethical situations that have taken place within the forensic science community. Attendees will be presented with scenarios and the ethical considerations involved with each. The attendees will provide insight from their work environments and represent the “real-world” of ethics in forensic science. Participants should be open to discuss and debate, while keeping an open-mind and a positive environment.

(W5) Stress, Trauma and the Forensic Workforce: Taking Steps to Recognize and Address the Issues

Presented by Dr. Amanda L. Farrell and Dr. Timothy Ainger

Half Day Workshop - Wednesday, May 8 - Morning (Member \$100/Non-Member \$150)

After attending this session, the attendees will understand and recognize how stress and trauma are tied to the forensic professions, including in the form of vicarious trauma (1-7), and how exposure to trauma and stress impacts employee’s personal and professional performance. Attendees will be more aware of the various types of trauma that investigators and investigative personnel routinely encounter and the potential impacts this may have, not only on the individual, but on the investigation and/or service provision after attending this workshop. Paths forward and the development of evidence-based policy (EBP) will also be addressed, so that attendees can

examine what policies and assistance are available in their own agencies, or to be able to aid in policy development.

In seeking to serve communities as investigators or forensic professionals, many of individuals are exposed to things that the average citizen cannot understand—from violent crime scenes, to death investigations and autopsies, to exposure risks related to fentanyl and fentanyl analogs, to reviewing materials in indecent images and child exploitation investigations—and so on, and sometimes these experiences stay with the individual. Recognizing that certain trends, such as the opioid crisis, can exacerbate the existing levels of stress and trauma faced by various personnel, best practices suggest that an agency that is trauma-informed and has made preparations for employees will have better success in terms of keeping employees happy, healthy and productive. But how and where does this discussion start, when, up until the last few years, this was treated as “part of the job” and personnel were expected to be strong enough and well-suited to deal with the potentially negative impacts the career path chosen? How do individuals, supervisors, and agencies effectively address stress and trauma? Building on the response to Farrell and Ainger’s (8) 2018 AAFS presentation on the impact of trauma on investigators, this workshop aims to open discussion on a topic that is not only often considered to be taboo, but also by highlighting the potentially different trauma experiences that investigative and forensic personnel face and how, while more attention is being placed upon first responder exposure to trauma and their subsequent resilience, this focus may mask or overlook specific needs of investigators and forensic personnel, who are likely to experience trauma for a longer duration and in a different manner.

Cognitive implications subsequent to traumatic exposure are varied in presentation and require management, but may be difficult for supervisors and forensic personnel to detect. Amnestic complications associated with dissociation (9), as well as shifts in cognitive schemas (10) following traumatic exposure have implications on both subsequent cognitive functioning and possible applications of insight-based treatment approaches. The cognitive impact of trauma can be seen in both primary and vicarious/secondary trauma exposure (e.g., peers, treating clinicians (11)). Furthermore, some research has suggested a negative impact on executive functioning (12, 13) and memory (14), which may even be compounded by repeated exposure to trauma (15). These cognitive skills which are necessary to effective job performance for forensic professionals are repeatedly being shown in the literature to be impacted by exposure to trauma.

Recognizing and addressing the impacts of direct and vicarious trauma on forensic personnel is especially important because employee burnout can represent not only the loss of an employee, but also the financial investment the agency or department has made in that individual’s training and development, yet again highlighting the importance of striving for well-developed and empirically supported policies that protect both the financial interests of the agency and the jurisdiction, as well as the well-being of agency personnel. Even if the employee impacted by stress and trauma does not leave the agency, he or she may represent a financial loss to the agency in terms of decreased productivity, costs associated with workers’ compensation, litigation fees, frequent absenteeism, and other similar costs (16-18). In the current economic climate of budgetary cuts and a “do more with less” attitude, these statistics suggest that a cost effective approach, and evidence-based policy (EBP), should involve effective training and preparation, as

well as swift intervention, to avoid personnel developing long term symptoms of psychological trauma and/or lingering cognitive deficits in the aftermath of trauma exposures. Thus, it is clear that there are psychological, training, retention and fiscal issues that cannot be disentangled from policy and practice and that the development of comprehensive EBP is necessary.

Many times, professionals may not recognize the psychological impacts, behavioral and cognitive, of exposure or repeated exposure to trauma and the easiest response may be to identify these impacts as an individual problem. However, as research, Critical Incident Stress Management Teams, Peer Support Teams, and the recognition of the impacts of vicarious trauma have demonstrated, these problems are more pervasive and of a greater magnitude than previously acknowledged in the first responder community. That recognition is slowly broadening to include investigative personnel and support personnel, as well. Based on previous research and work, the speakers in this panel provide a multidisciplinary approach that agency personnel, both line level and supervisory, can relate to and use to gain actionable insight. It is the goal of this presentation team to increase the level of knowledge surrounding post-traumatic exposure and work towards removing the stigma associated with mental health in the community of forensic professionals. In raising the level of awareness at the ground and supervisory level, presenters hope that teaching detection, treatment, and even providing prophylactic mental healthcare can lead to an improvement in forensic professional wellbeing, as well as increased workforce retention and decrease in loss of personnel due to posttraumatic health factors.

This workshop will aid attendees in identifying factors associated with these needs and their expression, particularly with regard to identifying “problem behaviors,” and detecting the symptoms of post-traumatic exposure, in addition to identifying empirically-supported strategies for proper identification and management of cognitive concerns. Attendees will be exposed to a wide array of behaviors, as well as how these behaviors can be identified and addressed. Topical discussions will be further supported by case studies, videos, and the use of crime scene photos to provide numerous examples.

This will impact the forensics community by providing the attendees with the understanding that the human experience is variable, and trauma exposure and symptoms even more so, leading to behavior patterns that can be complex and abstract. By recognizing the manifestations of a variety of psychological—both behavioral and cognitive—impacts as a reaction to trauma and stress exposure on the job, as well as identifying whether an agency is trauma-informed and what resources are available to employees, the attendees will be better equipped to understand the potentially short- and long-term impacts of trauma, as well as how to adapt investigative approaches and provide resources that will lead to increased chances of not only a positive work environment, but likely a more efficient and cost-effective solution to maintaining employee health and well-being to avoid burn-out and decreased cognitive abilities that may impact service provision and job performance.

Note: This workshop may use many cases, videos and discussions points to illustrate the conceptual and applied understanding of how trauma and its impacts manifest. Given the nature of the material, this workshop is not recommended for those persons who are sensitive and/or in some form of crisis.

CRIMINALISTICS SECTION WORKSHOPS

(W6) Navigating your way through the challenging NPS landscape

Presented by Dr. Donna Iula, Cayman Chemical Company (MAAFS Vendor)

Half Day Workshop - Tuesday, May 7 - Morning (Member \$100/Non-Member \$150)

The purpose of the reference material producer (RMP) is to provide analytical quality materials that may be used in any stage of the measurement process. This workshop will discuss the different versions of analytical materials end users may encounter and how to decide which are fit for purpose in your analytical schemes. This workshop will also review the current state of the evolving NPS market and discuss the process RMPs take from conception (identifying a new threat) to making high quality ISO 17034 reference materials available to the forensic community.

(W7) Fighting Fentalogues, seeing Syn Canns, and a Little bit of Uncertainty

Presenters: Jackie Caterino and Emily Wilkinson, Allegheny County Crime Laboratory

Half Day Workshop - Tuesday, May 7 - Afternoon (Member \$100/Non-Member \$150)

This workshop will cover multiple topics that address issues currently being encountered in labs. The first is the difficulty in analyzing fentalogues. Due to the number of closely related substances, separation for chromatography can be a concern. There are numerous compounds that have been found to co-elute using traditional columns such as DB-1 and DB-5. This workshop will look at other column types and method parameters to show how separation can be optimized. The second topic involves the analysis of synthetic cannabinoids on paper, a matrix that has been increasingly encountered. A study was done using different wavelengths of light to determine if there was a way to optical identify papers that may have been dosed with synthetic cannabinoids. And the final topic is a hands-on look at uncertainty in drug chemistry. This short exercise helped our lab visualize uncertainty of measurement.

(W8) Analysis of Cannabinoid Potency and Pesticide Residues in Cannabis Flower Regulated by California State using HPLC and LC-MS/MS: Practical Considerations

Presenters: Michael T. Costanzo, Perkin Elmer (MAAFS Vendor)

Half Day Workshop - Wednesday, May 8 - Morning (Member \$100/Non-Member \$150)

Over 30 states in the U.S. have legalized the use of cannabis for both medicinal and recreational purposes. In addition to maintaining quality control of cannabinoid levels in plants, states require testing for pesticides, since chronic exposure in humans can lead to considerable health risks. Currently the State of California has issued the most comprehensive list of pesticides and most stringent regulatory limits. This workshop will discuss instrumentation needs to consider for comprehensive cannabinoid testing, monitoring cannabinoid potency by HPLC, analysis of all nonvolatile, semi-volatile, and volatile pesticides in cannabis flower required by the State of California using a single LC-MS/MS instrument, as well as analytical challenges and sample preparation considerations in general.

(W9) The Modern Mobile Analytical Laboratory – Maximizing your analytical capabilities with infrared, Raman and x-ray fluorescence spectroscopy

Presented by Dr. Tom Tague, Bruker Scientific (MAAFS Vendor)

Half Day Workshop - Wednesday, May 8 - Afternoon (Member \$100/Non-Member \$150)

Bruker has long been at the forefront of providing advanced analytical instrumentation for scientific research and industrial applications. Our instruments have helped skilled and knowledgeable scientists in leading industries and academic institutions around the world to characterize unknown compounds, assess product related quality issues, and develop new and important compounds and methods. Bruker laboratory based technologies in use for these important and often complex materials include wavelength and energy dispersive x-ray fluorescence, micro-x-ray fluorescence, nuclear magnetic resonance spectroscopy, electron paramagnetic resonance (EPR), x-ray diffraction, Raman spectroscopy, Fourier transform infrared (FTIR) spectroscopy, matrix-assisted laser desorption/ionization mass spectrometry, and liquid chromatography-mass spectrometry. Of these, Raman, FTIR, and x-ray fluorescence (XRF) are particularly well suited for the identification and characterization of unknown materials.

Bruker now provides a mobile laboratory solution for nondestructive, noncontact elemental and molecular compound analysis, where these important and powerful techniques can be brought to samples of interest. Portable XRF, Raman and FTIR spectroscopy analyzers work together to enable users to gather as much information as possible content of materials and products. XRF provides elemental analysis, valuable for characterizing inorganic materials, and Raman and IR are adept at characterizing molecular species.

This workshop will discuss the principles governing these techniques as well and real world examples of their application to industrial (plastics, pharmaceuticals, etc.), cultural heritage, and academic objects. There will be a hands-on portion of the workshop where attendees are encouraged to bring samples for analysis.

(W10) Novel Psychoactive Substances (NPS), Structural Isomers, and Analogs

Presented by Elizabeth Gardner, University of Alabama at Birmingham

Half Day Workshop - Wednesday, May 8 - Afternoon (Member \$100/Non-Member \$150)

In the early 2000's, efforts to undermine illicit drug markets in the US and Europe focused limiting access to the precursors for cocaine and MDMA, respectively. The efforts were successful, in that the purity of cocaine dropped to 49%, while the price rose by 77%. In England, by June 2010, almost no ecstasy pills contained MDMA. This led emergence of Spice and Bath Salts, eventually identified as cathinone analogs and cannabinoid agonists. As the new substances were controlled, head shops and the internet were flooded with new analogs. In the year 2014, 101 new psychoactive drugs (NPS) had been reported to the EU Early Warning

System. At this time, NPS hit Europe about 2 years before entering the US. Legislatures struggled to find ways to keep up with the flood.

Even as the NPS were brought under control, opioid abuse was rising in the US. Efforts to control the abuse of prescription opioids led to a resurgence of street heroin. Illicit drug manufacture began to focus on heroin analogs. A kilo of fentanyl, purchased for a few thousand dollars, can produce nearly 500,000 two mg pills to be sold at \$10-20.00 each.

In this workshop, strategies for differentiating between structural isomers will be presented. The analysis of two 'Legal Highs' purchased from online vendors using NMR to verify the chemical structure of isomers with similar mass spectra and different GC retention times.

The second strategy will address distinguishing fentanyl analogs using ToF MS and GC-MS to with the same molecular weight, but with different mass spectra, the same molecular weight with similar mass spectra, but with different retention times, and different molecular weight, but similar mass spectra and retention times.

QUESTIONED DOCUMENTS SECTION WORKSHOPS

(W11) Examining Writing on Unusual Surfaces

Presented by Gregg Mokrzycki and Peter Belcastro

Half Day Workshop - Tuesday, May 7 - Morning (Member \$100/Non-Member \$150)

Workshop will be held off site at West Virginia University (transportation will be provided)

This half day workshop will focus on the fundamental concepts of writing on walls, mirrors, body parts, wood, wax, and other unusual surfaces. This fundamental workshop was developed for document examiner trainees, recently certified document examiners, and those examiners with limited experience with these types of examinations. Instruction and discussion will cover the collection of known samples in such scenarios, limitations associated with these types of writings, collection and preservation of the evidence, and issues concerning photography of the questioned writing. In addition, attendees will be given several practical problems and asked to conduct examinations and share their findings with the group.

(W12) Examination of Torn/Cut Edges

Presented by: Lorie Cousin and Peter Belcastro

Half Day Workshop - Tuesday, May 7 - Afternoon (Member \$100/Non-Member \$150)

Workshop will be held off site at West Virginia University (transportation will be provided)

This half day workshop will focus on the examination and imaging of torn and cut edges from a variety of evidentiary items, including paper, stamps, tape, and other substrates. Instruction and discussion will cover techniques used to examination the cut or torn edges, cleaning of items previously treated for latent prints, instruments used to examine the edges, and imaging the edges for demonstrative purposes. Discussion will also include interesting cases, the collection of known samples, and limitations encountered with torn and cut edge comparisons. In addition, attendees will be given several practical problems and asked to conduct examinations and share their findings with the group.

(W13) How Chemical Examinations of Inks and Paper Can Corroborate and Supplement Forensic Document Examinations (Wednesday, Full Day)

Presented by: Gerald M. LaPorte, MSFS

Full Day Workshop - Wednesday, May 8 (Member \$150, Non-Members \$200)

Often times, the forensic examination of documents requires a comprehensive suite of testing to provide the most information possible regarding how and when a document was created and if a document is authentic with respect to the purported date of preparation. The purpose of this workshop is to provide attendees with a background in how chemical examinations can be used to corroborate and supplement a host of forensic document examinations such as: i) ink and paper comparisons; ii) indentation and impression results including sequencing of impressions; iii) determining whether multiple documents dated over a course of time were prepared contemporaneously; iv) results from video spectral analysis or hyperspectral imaging; v) interpretation of alterations and obliterations; vi) printing process determination; and vii) to potentially corroborate qualified handwriting conclusions. Attendees will be introduced to the general concepts of thin layer chromatography (TLC), gas chromatography/mass spectrometry (GC/MS), and other analytical methods to understand their application to forensic document examination and the limitations of the testing. Participants will also be introduced to the basic concepts of color and light theory as it applies to video spectral analysis and certain imaging techniques. A major portion of this session will include a discussion and analysis of questioned documents from adjudicated cases. The workshop participants are not required to have a background in chemistry since the main objective is to provide an overview and understanding of how chemical methods can help to elucidate some background about the materials used to compose a document such as writing inks, printing inks, paper, and other materials that could be used to alter or artificially age a document.