

News of the California Association of Criminalists • First Quarter 2020

The President's Desk

## alice Hilker



CAC President

Given these numbers, the CAC Membership is once again favoring change. I will work with the CAC Board to draft revisions to the Bylaws to allow yearly meetings and to begin transitioning to the format of one meeting per year, starting in 2021...

## IRL (in Real Life)

The holidays are upon us! As I write this, we are back to work from Thanksgiving break and it is four short weeks from the end of another year, and perhaps more shocking, the end of the decade. As I reflect on this past year during this holiday season, I am thankful to be able to work in this profession, to serve on this CAC Board, to be able to attend seminars, and to have the honor to present awards to those who are making significant contributions to Criminalistics. I am especially thankful for the opportunity to meet the changing needs of our members as we enter a new year.

As everyday interactions between people become more digital, I am thankful for study groups and seminars, which provide experiences In Real Life (IRL). While we can exchange vast amounts of information quickly online, there is still something to be said for these IRL experiences. The CAC provides these IRL venues for members to reunite with colleagues from other laboratories, debate and present ideas in front of peers in small or large-scale forums, listen to scientists in other disciplines, learn from interesting case presentations, and meet potential employers or employees. Yes, there is a version of this online, where presentations can be viewed conveniently at any time or place, where comments can be posted with ample time to craft and rewrite, but it lacks the texture, requires less creativity, and is more restricted than interactions experienced in the moment and IRL. So, especially if you have never been, get out there and attend a study group or seminar near you!

For those of us who were active CAC members about twenty years ago, you may recall the posted announcements for short afternoon meetings with discipline-specific groups followed by dinner with presentations. The CAC responded to feedback from the membership and changed the event format to having a lunch speaker in the middle of morning and afternoon study groups. We then converted to an online registration format to ensure there was sufficient meeting space available. Starting now, certificates of training will be available for all registered attendees (Non-Members too!), with the number of hours of training listed to comply with ABC Recertification guidelines. These changes occurred in response to our membership! With these new changes in place, please continue to encourage your colleagues to attend and contribute to the study groups.

Those of you who recently renewed your Membership were asked whether you would like to continue to have two semi-annual seminars or go down to one annual seminar. Remarkably, the results (as of 12/2/2019) were as follows: 241 Members have no preference, 238 Members prefer one meeting per year, and 106 Members prefer semi-annual meetings. Given these numbers, the CAC Membership is once again favoring change. I will work with the CAC Board to draft revisions to the Bylaws to allow yearly meetings and to begin transitioning to the format of one meeting per year, starting in 2021, as we currently are struggling to find a second laboratory to host. This is a great opportunity for a Laboratory to step up and volunteer to host!

Acknowledging that we need and that our Members expect both online and IRL experiences, the CAC is trying to improve both with regards to our content. The CAC website has been updated to run more efficiently and to be more user friendly. We will also be working on new digital formats for the *CACNews* to modernize our publication.

In closing, I am grateful for all of the improvements to technology that have made my life easier, and I am grateful for all of the IRL experiences that have made my career in forensics what it is today. Your CAC Board and I will continue to strive to improve both experiences for our Membership.

Alice

FIRST QUARTER 2020





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The deadlines for submissions are: December 1, March 1, June 1 and September 1.



#### On the cover:

Paula Ono and Andrea Boon (r) participate in the Saliva Stain Mapping workshop at the Fall 2019 seminar in Ontario. More photos inside.

#### INSIDE

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## jonathan Charron



CAC Editorial Secretary

By having this stamp of accreditation, some of the freedoms a generalist would have enjoyed are lost. With a heightened emphasis on proficiency testing, a criminalist must now weigh the value of remaining proficient in multiple disciplines.

# We Are All Criminalists

When one is asked to think of California, a multitude of images may begin to flood the mind. Being originally from Reno, Nevada, my first thought of California is of the snowcapped mountains of the Sierras. Someone from the middle of the state may conjure images of neatly manicured rows of corn or almond trees, while a coastal native may recall the smell of the ocean or an image of the fog slowly retreating to the sea. Yet someone who has never been to this mighty state might believe that we all have sun-kissed blonde hair and enjoy endless blue skies while cruising around on our surf boards. Individual beliefs of what California is are not exactly accurate, but none of them are exactly wrong. If you drew from only one person's idea of California, you would get a very narrow perspective of the entire picture. But does that make each of those images any less powerful? Does the lack of firsthand knowledge of the sunny beaches of San Diego cause the mountains of Tahoe to be any less majestic? I think most people would say no. But I would argue that by having knowledge of both the mountains and the beach, one's understanding of the entire state is enhanced.

Similar to California, forensic science is a complex topic comprised of various disciplines. A conversation about our world might start with a conversation about the capabilities of DNA analysis and end with a discussion about the newest drug trends we see coming into the laboratory. While the type of work that a criminalist is responsible for hasn't changed much over time, the responsibility of whom does what part of the work has. At various conferences, I have often heard the term "generalist" mentioned when discussing how things used to be done in the laboratories and how criminalists nowadays are only "specialists" in one area of forensic science. Previously, a criminalist would be assigned a case with various categories of evidence and that one criminalist would perform the entirety of the analysis. These "generalists" enjoyed the benefit of being tasked with taking an item of evidence and processing it using a multidisciplinary approach. In an extreme example, a single criminalist may have had the training to collect and examine trace evidence from a firearm, to lift and compare the fingerprints on the frame, test and confirm the presence of blood on the muzzle, all before comparing the firearm to cartridge cases found at the scene. This "generalist" approach is no longer practical in the current state of forensics, which I feel is largely the reason criminalists are now more specialized.

While there are some benefits to having an individual work multiple components of a case, the forensic world we live in now is drastically different than twenty years ago. Criminalists now exist in a world saturated with accreditation standards, annual proficiency tests, and constant criticism in both the courtroom and court of public opinion. In 1999, ANAB adjusted their accreditation standards "to a foundation based on ISO/IEC 17025" while previously providing accreditation to forensic laboratories since 1982. (1) Upon searching ANAB's website, I found that there are currently 544 organizations that have some type of accreditation in forensic testing through ANAB. (1) This large number of organizations demonstrates the push to perform work under the guidance of accreditation standards. While not a perfect system, I see the intended purpose of accreditation as a way to ensure that the procedures, instrumentation, and ultimately reported results are accurate and within the parameters set in ISO/ IEC 17025 standards.

By having this stamp of accreditation, some of the freedoms a generalist would have enjoyed are lost. With a heightened emphasis on proficiency testing, a criminalist must now weigh the value of remaining proficient in multiple disciplines. I am starting to hear conversations regarding "How many proficiency tests do I have to do this year?" With casework quotas and yearly proficiency tests in each discipline, maintaining the requirements of more than two disciplines may force a criminalist to be burdened with a cycle of seemingly endless tests and less critical casework in order to meet the standard. While important to maintain standards, the requirements of time away from the endless onslaught of casework can cause some labs to limit a criminalist in the number of areas they can remain proficient in due to cost and time.

Part of the reason I wanted to discuss this topic is due to a conversation with a group of criminalists about the PCAST (President's Council of Advisors on Science and Technology) report released in 2016. A few of these criminalists had not heard of this report. Being a firearms examiner, I was surprised at this as I had been discussing and following this report very closely. This was a wake up call for me and why I feel it is important that we bridge the gap between the concept of a generalist and specialist.

The rules of the game have changed for many of those working in a laboratory setting. We do not get the opportunity to explore every facet of a case full of various types of evidence but are brilliant at understanding and interpreting our one piece of that puzzle. I urge you all to continue to make strides in your discipline, strengthening the science and procedures that allow you to get your part of the work complete. I also urge you all to adopt a global mindset when it comes to your part of the picture. It is important that we look at our piece of evidence and consider what value may be present to a different specialist across the hall.

We are all criminalists. It is our responsibility to know as much as we can possibly retain about the foundations, present practices, and future and emerging changes within the disciplines we perform work in. While the chips may be stacked against a criminalist who desires to still function as a "generalist", it is our duty to maintain a generalist's approach. Take the time to reach out to people in other disciplines to learn what is new in their corner of the room. Offer to speak at lab wide meetings or at a CAC conference and talk about a new technique or technology to share with those outside of your specialty. Swing by every single vendor booth at a conference to learn from those who create the tools used in the field regardless if you will ever personally use it. And perhaps most importantly, take the time to speak with each other. Share your memories of the craziest scene you've ever been to with someone who has just been hired or grab lunch with the person a month away from retirement to discuss how a new instrument may change the future of the way we do things. We are all criminalists; whether you consider yourself a generalist, specialist, or something in between, it will be through these conversations, sparked without judgement, that we will find common ground, develop respect, and strengthen the overall knowledge of our community.

(1) https://anab.ansi.org/forensic-accreditation

Juithn & Chim



Helena Wong (l) and Melissa Moore attend the CSFS Autumn Conference

## **CSFS** Autumn Conference

As the 2016 Paul Kirk Award recipient, I recently had the privilege of attending the 60<sup>th</sup> Autumn Conference hosted by the Chartered Society of Forensic Science. This year's theme was focused on learning from each other's experience, whether good or bad. Speakers were advised to present on difficult topics we all may experience from time to time, such as a traumatic crime scene or how to navigate through a nightmare accreditation journey.

During the past few CAC seminars, I noticed that there has been an increased awareness on how to deal with the stress that comes with the job of being a forensic scientist. This topic was first presented by Jamie Lajoie during the Fall 2018 meeting in San Diego. Shortly afterwards, the CAC held a workshop titled "Managing Trauma in the Workplace" in Oakland during the Spring 2019 meeting. It was very interesting and exciting for me to see that our fellow colleagues in Europe were also mindful on this issue. Jessica Adby from Key Forensic Services gave a standing ovation presentation on her personal journey through dealing with the stress that built up over time from attending numerous crime scenes. She shared that not only did it affect her mental health, but it also affected her relationship with her family. While many of us in this career have developed the ability to compartmentalize most of the terrible things that we see at work and not let it affect our personal life, everyone in the room during her presentation, at one point or another, was able to relate to her experience.

The topic that I presented on was a traumatic event that hit close to home for many of us at the Oakland Police Department. Four OPD officers lost their lives in the line of duty on March 21, 2009. The officers were brutally shot, a few of them in the head. The crime lab responded to the scene and those who were there had to witness the tragic scene and the blood that was left behind by people that they had

please turn to page 22

Doublesake — is s Magic!

Let's check in and get our goodie bag. Then we'll head over to the workshops we signed up for. If you weren't able to make this seminar then you missed the magic of seeing old friends and making new ones, hearing about the latest trends in forensic science and law, and getting your hands on the latest technology. Hint: Plan now, the Spring 2020 seminar is coming up fast!























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# Monday & Tuesday: Check-In, Workshops and Board Meeting

















# Dednesday: General Session, Dosters, New Members & Dendors



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# Thursday: Dapers, Dendors, Business, Awards and ...



Magic!





























# Friday: Dorkshop on Collection Photos on this page are courtesy Janet Whitworth







(top l-r)Anthony Longhetti Distinguished Member: Adam Dutra; Edward F. Rhodes III Memorial: Mark LaVigne; (middle l-r) Michelle Pirestani and Jane Whitworth (Seminar co-Chairs); Megan Caulder (DNA Study Group Chair). In addition to those pictured, Service Awards were announced for Rebecca Berlin (Financial Review Committee), Jeff Thompson (Ethics Committee), James Lukens (NorCal Digital Evidence Study Group Chair), Katherine Hutches (NorCal Trace/Arson Study Group Chair), Jonathan Charron (Awards Committee Chair), Helen H. Ha (Best Poster Spring 2019), Eric Halsing (Alfred A. Biasotti Most Outstanding Presentation Spring 2019) and Eleanor Salmon (DNA Tech Lead Study Group).



Your 2019 CAC Board of Directors (l-r): Membership Secretary Megan Caulder; Southern Regional Director Stephen Lu; Immediate Past President Mey Tann; President Elect Jamie LaJoie; President Alice Hilker; Treasurer Helena Wong; Northern Regional Director Cindy Anzalone; Recording Secretary Gunter Scharnhorst. (Not photographed, Editorial Secretary Jonathan Charron.)

## ABSTRACTS FROM THE FALL 2019 CAC SEMINAR

## The past, present and future of Forensic Genetic Genealogy

Richard Edward Green, Associate Professor, Biomolecular Engineering at University of California Santa Cruz

Forensic Genetic Genealogy is a powerful new approach for identifying leads from DNA analysis. However, sample requirements for typical genotyping preclude its use for many cases. We have developed a powerful new approach for recovering and sequencing minute amounts of fragmented DNA. This approach allows the small nuclear DNA fragments in rootless hair, bone, and other sources to be amenable for DNA analysis. This workshop will describe this technology and its limitations.

#### **Preparation of Samples for NIST Firearms Study**

Donald T. Jones, San Bernardino Sheriff's Department, Scientific Investigations Division (ret)

Abstract: Selected handguns from the SBSD crime lab reference collection were test fired for entry into a nationally accessible firearms database being created by the National Institute of Standards and Testing (NIST). In all, 284 guns were fired. This consisted of fifty 380 semiautomatics, seventy-six 9 mm semi-automatics, forty .357 magnums, sixty-seven 38 specials, fourteen 40 caliber pistols, and thirty-seven 45 semiautomatics. Breech face and firing pin classifications based on observations of the guns and the number of lands in the barrel and direction of rifling twist data were recorded for bullets from each firearm. Three cartridges were fired through each barrel, then all bullets and fired cartridge cases were submitted to NIST whose personnel will facilitate the entry of each into a 3-D database.

Forensic firearms examiners will be able to search this database using various algorithms to assist with the interpretations of their examinations.

#### **Ethics and Purposeful Leadership**

*Dr. Thomas Horan, Dean of the School of Business at the Univ. of Redlands* 

Dr. Horan will present Purposeful Leadership in the 21st century. Purposeful leaders develop and execute organizational goals in an ethical, data driven, analytical and socially responsible manner. Such leaders align how they lead their organization with core values and motivate others as well. Purposeful leadership is an integrated approach that aligns personal strength, effective teams and organizational success. Dr. Horan's lecture will include an introduction to Purposeful Leadership and its four pillars of Self, Teams, Organization, and Society. The focus will then shift to explaining each of these elements, including their constituent concepts, with reference to their application to criminalists. For example, Dr. Horan will expand on the concepts in the 'self' level of Purposeful leadership by explaining how one's values and personal ethics, strength, commitment, and integrity play a role in shaping one's personal arc of leadership. The session will be interactive and participants will also engage in completing assessments including developing their own personal arc of leadership.

#### **Reference Population Database of Firearm Toolmarks**

Xiaoyu Alan Zheng, Johannes Soons, Erich Smith, Martin Baiker National Institute of Standards and Technology, Federal Bureau of Investigation, Netherlands Forensic Institute

The last decade has seen exciting progress in the development of measurement instruments, algorithms, data, and methods to facilitate objective analysis of toolmark comparisons. the science of firearms and tool mark analysis. The primary goal is to provide firearms and tool mark examiners the ability to support their testimonies with objective similarity values and statistically-sound quantitative expressions for the weight of the evidence. The National Institute of Standards and Technology (NIST), for example, developed correlation algorithms, procedures to estimate error rates, and standards for measurement quality control. The Federal Bureau of Investigation (FBI) is evaluating a wide range of instruments and methods for the application of three-dimensional (3D) tool mark topography data in case work, including validating virtual comparison microscopy for use in casework. The Netherlands Forensics Institute (NFI) has developed and implemented comparison algorithms, a tool mark database, and statistical models in their Scratch software platform to enable estimation of quantitative expressions for the weight of evidence, such as likelihood ratios. These and many other tools and procedures have shown great promise in smallscale comparison tests of known matching (KM) and known non-matching (KNM) data sets. However, the validation of these methods, and their application to casework, requires a reference database of tool mark data and comparison results.

In 2018, NIST, FBI and NFI started development of the Reference Population Database of Firearm Toolmarks (RPD-FT). The database will contain firearm tool mark data, indexed by class characteristics, and associated quantitative comparison scores for various similarity metrics. The database serves as the foundational ground-truth that will ultimately enableexaminers to report what statistical confidence they have for a comparison result. The tool mark population statistics extracted from the database will describe the frequency distributions of a similarity score for, respectively, same-source comparisons and differentsource comparisons of tool mark samples. These distributions are required to estimate numerical expressions for the weight of the evidence, such as a likelihood ratio or error rates. No matter which statistical method or distribution model is used, a large and diverse reference population of ground-truth data is required for reliable conclusions. From this data, the population distributions relevant to the case will be extracted as defined by the evidence's class characteristics. RPDFT is designed to be maintained and updated on an ongoing basis with additional firearms and comparison metrics to ensure diversity and coverage of relevant tool marks observed in casework. The reference data can also be used to advance research into new statistical models and objective comparison methods, allowing industry partners to provide better tools to support the examiner's conclusions and testimony. The development of the reference database builds on the NFI Scratch software platform and the NIST ballistics toolmark research database. The database is designed to encompass a variety of existing and future comparison metrics. Measurements are being performed at NIST and the FBI. The presentation will describe the overall design, workflow, potential implementation steps, and limitations of the RPDFT.

#### Three Dimensional Documentation and Analysis of Cast-Off Stains

#### Eugene Liscio, FARO

The use of 3D technologies such as the laser scanner and photogrammetry for documentation and analysis of bloodstains are powerful tools. Research in this area has shown that the accuracy and repeatability of determining the area of origin using these methods is in agreement with traditional methods. 3D technologies allows for more complex scenarios to be recorded with the added benefit of reducing documentation time. This opens up the door to highly complex bloodstain patterns that would otherwise not be attempted using conventional methods. Cast off stains have been an elusive type of pattern which has traditionally had limited utility. This presentation takes a second look at cast off stains and investigates how they might be able to provide additional information by looking at empirical test data.

#### Feasibility of Objective Identification for Inoperable Firearms

Joseph Labrum, Michael Stocker, Brian Renegar, Johannes Soons, Robert Thompson, National Institute of Standards and Technology (NIST)

Forensic firearm and toolmark analysis relies on the unique individualizing toolmarks that are created and remain on their respective surfaces during manufacturing. The random nature of these toolmarks are directly related to the type of manufacturing processes used to shape (e.g., milling, drilling, grinding) and finish (e.g., sanding, honing, blasting) these surfaces. Other factors, such as material build-up on the cutting tool and tool wear, will influence the random nature of their creation. For more than a century, firearms examiners have made their determinations of similarity of these toolmarks based on visual examination through a comparison microscope. Today, the discipline is undergoing foundational changes as it moves towards implementing objective methodologies (based on 3D surface topography measurements), with the goal of supplementing an examiner's testimony with objective similarity metrics and statistically supported error rates.

The past decade has produced numerous advancements in this area of research on many fronts; ballistic reference databases, identification algorithms, error rates, quality assurance, instrumentation, etc. Objective identification methodologies have shown great promise, demonstrating acceptable degrees of separation between known matching (KM) and known non-matching (KNM) data sets, in addition to providing quantitative estimates for the weight of evidence. To this point, the entirety of the research has focused on computer-aided determinations of similarity between fired cartridge components, mostly looking at breech face impressions and striated markings on fired bullets.

In casework, firearms examiners sometimes encounter situations where a suspect firearm is rendered inoperable. In these situations, an examiner may look at casts of the different toolmarking surfaces of the firearm for the purpose of comparing to evidence. Examiners know, for example, that breech face impressions on a test-fire and a cast of the firearm's breech face will look qualitatively different, but individualizing markings exist on both to the extent that it is2possible for an examiner to make an identification. Casting processes are known to accurately extract fine detail from surfaces they are replicating, in this case more detail from the breech face. How this additional detail affects a computer-aided determination of similarity (cast to test-fire) is an unanswered question.

An experiment was conducted to look at this issue. Casts of the breech face of a firearm were compared to test-fires from the same firearm. Three casts each often consecutively manufactured Smith and Wesson M&P9 slides were made. This presentation will compare and contrast how the KM and KNM distributions from the casts appear relative to distributions from test-fires of the same slides. To calculate an error rate, the casts similarity scores will need to be compared to a background population created from test-fires. The effect of mixing similarity scores will be examined to understand its effect on generating an error rate. Some initial measurement and analysis of how the surfaces of the casts and test fires differ will be shown.

## Furensics Continued: Investigating Yet More Crimes through DNA

Christina Lindquist, University of California, Davis, Veterinary Genetics Laboratory- Forensics section

In 2017, investigators in Oceanside, CA, were called out to investigate the disappearance of one of the Palketta family dogs, Lala the golden retriever. Both Lala and their Chihuahua went missing 2 days after the family moved onto a cul-desac in a nice neighborhood. The Chihuahua was found by a neighbor and returned, but Lala was never seen again. Investigators suspected a different neighbor, Mr. Herbert, of being involved. When they searched his vehicle they found saliva on the window, a brownish red stain on the back seat, and a baseball bat with a brownish red stain. VGL-Forensics analyzed the evidence and found not only a female canine profile, but also a profile of a male canine! After discovering the male canine profile, investigators were able to solve another animal cruelty case as well. The suspect, Mr. Herbert, was found guilty on all 6 counts of animal cruelty.

At VGL-Forensics, we see evidence from many types of cases, including human-on-human crimes where dog or cat biological evidence links a suspect to the crime, to large-scale dogfighting, species identification, and animal cruelty cases. VGL-Forensics is the sole crime laboratory ANAB accredited for analysis of DNA from domesticated animals. Case examples will be presented demonstrating the wide range of applications of forensic animal DNA evidence, potential sample sources, and the range of species available for testing through VGL-Forensics.

# The application of Raman and X-ray Fluorescence spectroscopy to analysis of duct tapes

#### Sergey Mamedov, Horiba Scientific

X-Ray Fluorescence (XRF) and Raman spectroscopies are useful tools for recognizing substances and confirming their identity with little or no sample preparation. XRF provides information about elemental composition of the material, whereas Raman spectroscopy offers molecular informa-

### ABSTRACTS cont'd

tion. X-ray fluorescence and Raman analytical microscopes were used in this study. The research of this study is to demonstrate the application of Principal Component Analysis (PCA) to classification of duct tapes. We will likewise show that the Data Fusion Technology can be used to improve results of such classification. We will then compare and discuss the results of single source and data fused analysis. For the purpose of this research, we used micro-XRF and micro-Raman spectroscopy to analyze the spectra of duct tapes from seven different sources. X-ray fluorescence spectra of the materials were collected using 30 keV acceleration voltage and with X-ray spot size of 1.2 mm. Two excitation wavelengths (532 nm, 785 nm) were used to collect Raman spectra. XRF analysis was performed in the range of 1.00-40.96 keV. There are no spectral features in the energy range above 15 keV; spectra were truncated and analysis was done in spectral range of 1.00—15 keV. Some tapes contain elements Ti, Ca, S, and Al in a fiber substrate, which may be used for duct tapes differentiation.

Classification of duct tapes based Principal Component Analysis of the spectra will be shown. Small pieces of glue from the tapes were collected and Raman spectra of this material were measured in the range of 100-3500 cm-1. PCA was applied to these spectra to extract differences in connection with different source of the tapes. The data shows that PCA allows to differentiate the samples, for example, duct tapes #1020 and #1110 or #1230. PCA of duct tapes shows significant separation between duct tapes of different vendors and brands. Raman spectra of the materials show many common features with some differences, which may be originated from the filler. Data fusion technology was applied to the set of XRF and Raman 2 data to create PCA model. Classification of duct tapes was improved using fused data. PCA model performed on fused data are more robust and visual discrimination from class distributions is better with respect to those results obtained by individual classification.

#### The Lisa Case

#### Peter Headley, San Bernardino County Sheriff's Department

This is a presentation on the "Lisa case." This was the first use of genetic genealogy to identify a victim, then the suspect and laid the ground work for solving the golden state killer case along with many others since. This case also led into a completely new technology developed by Dr. Green in which he is now able to extract a full autosomal DNA profile up loadable to FTDNA and GEDMatch from hair strands only, no hair root needed.

#### **OSAC Update**

James Carroll, Cristina Gonzalez, Maria Ruggiero, Kim Shapiro Authors 1-3: Los Angeles County Sheriff's Department; Author 4: San Bernardino County Sheriff's Department

Formed in 2014, the Organization of Scientific Area Committees (OSAC) for Forensic Science seeks to strengthen the nation's use of forensic science by facilitating the development of scientifically sound forensic science standards, and by promoting the adoption of those standards by the forensic science community. This presentation will provide updates on the progress of the OSAC, current initiates, and the future of the organization.

#### It Could Happen to You: A Forensic Scientist in the Crosshairs

#### Gregory Laskowski, and Daniel Gregonis, Susan Coleman. Criminalistics Services International, LLC

The night of August 10, 1993 was no different than any hot August night in the remote areas of San Bernardino County, except for one thing. Members of the San Bernardino County Sheriff's Department homicide and crime scene response units were rousted from their sleep to respond to the report of a deceased body in a remote location of the county. When the teams arrived on scene, they found an isolated location with no power. The area was pitch black, so prudently it was decided to process the scene at sunup, occurring three to four hours later. Processing the scene went without incident. The seized evidence was bagged, tagged, and transferred back to the crime lab. That same evidence was later processed by San Bernardino Sheriff's Department Crime Laboratory Personnel. There was one notable occurrence at autopsy; a suspicious mark thought to be a bite mark was discovered on the hand of the victim. Detectives decided to send images of that mark to an outside expert for review, a well-regarded forensic odontologist named Dr. Norman "Skip" Sperber. After three trials ending with two hung juries and a mistrial, the San Bernardino County District Attorney's Office decided to call in Dr. Sperber to elicit testimony on the potential bite mark in a fourth trial. Dr. Sperber was sworn in and testified to the efficacy of bitemark comparison analysis and offered a qualified opinion, that he could not exclude the suspect, the victim's husband William Richards, as potentially having left the mark.

Years later, Dr. Sperber recanted his testimony when the photograph was rotated to correct distortion. This caused the California Supreme Court to vacate the conviction of the defendant. It also resulted in a new law passed by the California Legislature, drafted by the Innocence Project, characterizing prior expert testimony to be labeled as "false" when the testimony is later amended or changed. The fall out of this is that after the California Innocence Project obtained a reversal of the conviction, and the defendant was released, a private law firm filed a civil lawsuit against the County of San Bernardino, including its Sheriff's department, the the responding officer, the investigating detectives, Dr. Sperber, and Criminalist Daniel Gregonis. A number of allegations were alleged against the above defendants stemming from civil rights section 1983 claims including: conspiracy, malfeasance, planting evidence, giving false and misleading testimony, employee misconduct, inadequate training, dishonesty, abuse of power, violation of constitutional rights, and failing to preserve exculpatory evidence in violation of Brady. Plaintiff's counsel secured services of a number of forensic scientists in such fields as forensic pathology, forensic odontology, DNA analyses, forensic serology, crime scene investigation, and bloodstain pattern analysis who offered commentary, reports and deposition testimony, and photogrammetry.

On September 3, 2019, United States District Court Judge James Otero of the Central District of California granted summary judgement in favor of the County of San Bernardino and the named defendants, ruling the case closed. This presentation will discuss the facts of the homicide investigation, the evidence collected and its analysis. It will present the legal issues and hurdles encountered by defense counsel. The reports, testimony, and opinions proffered by plaintiff's experts will be discussed. And hopefully you will glean some tips on how to avoid suit, or at least how to defend yourself when it occurs.

#### Changing Rules of Evidence to Regulate Forensic Science Testimony

Mike Chamberlain, California Department of Justice

This presentation will discuss ongoing efforts to regulate forensic science in a manner consistent with PCAST recommendations. Most recently, there has been a push to amend the Federal Rules of Evidence to impose strict limits on how scientific witnesses may state their conclusions and opinions. Courts would be required to screen forensic science evidence more rigorously, and perhaps even dictate specific language that must be employed on the witness stand. If successful, these rule amendments may have a chilling effect on the admissibility of forensic science testimony in state courts as well.

## Opioids, Fentanyl and Emerging Drug Trends with the U.S. Crime Laboratories

#### Bruce Houlihan, Orange County Crime Laboratory

The opioid crisis is a significant challenge facing the United States. Crime laboratories in the United States are fully immersed in its impact: seized drug submissions contain increasing amounts of fentanyl and more lethal analogs; the number of cases and evidence containing opioids is increasing; new drug analogs continue to occur; driving under the influence of opioids and other emerging drugs is prevalent (including poly-drug use); and fatalities due to opioids and emerging drugs is an increasing area of attention. This presentation will discuss the national trends and dialogs surrounding the opioid and emerging drug crises, including examples from the Orange County Crime Lab. Many federal agencies are working with crime laboratories to collate information, report on trends, provide resources, and generate policy. Federal funding addressing solutions is also excellent, and resources for research to equipment and methods is available. Forensic professional organizations are also working on the appropriate role of forensic science practitioners in information-sharing, focus groups, legislative advising, and resource collaborations. As an example, ASCLD's Emerging Drugs Task Force is working to:

• Study and collate information from crime laboratories relating to the opioid crisis;

• Partner federal, state, and local agencies with private laboratories, coroners, medical examiners and other forensic groups on the opioid crisis;

• Supply legislative information and recommendations;

• Recommend safety best practices for crime laboratories and first responders;

• Summarize analytical and instrumental best practices for forensic opioid casework; and provide information for public safety. The number of groups working on data collection and integration is improving. NFLIS is expanding to toxicology, medical examiner, and coroner data; data from fentanyl-related deaths is of increasing importance; and the prevalence of driving under the influence of drugs (including prescription drugs) is a growing public safety threat. The synthesis of this data toward predictive trends may provide clear opportunities for the forensic and law enforcement community. Additionally, if new information can be integrated with existing seized drug data, the potential for improved diagnostics is promising. Crime laboratories play a unique role in this intersection, especially labs that provide both toxicological and seized drug information. Though the crisis is very real, there is significant activity throughout the forensic community not just to understand, but also provide the most effective and appropriate responses.

#### Lessons Learned from the Boston Marathon Bombing

Michael Connolly, Boston Police Department

This discussion will address the challenges and successes of processing an 8 block, post-blast crime scene from a Crime Scene Investigator's point of view. A candid conversation regarding the strains and stresses on a CSI Unit, the personnel and the approach to the healing process after all of the smoke had cleared.

#### Using Social Media to Help Solve Cases

Billy Jensen

An investigative journalist and victim's advocate focused on unsolved murders and missing persons using citizen detectives and crowd-solving (use of social media to help solve crimes). Author of "Chase Darkness with Me: How One True Crime Writer Started Solving Murders," Jensen also helped finish Michelle McNamara's book "I'll Be Gone in the Dark" about the Golden State Killer after her sudden passing.

His techniques of using social media to identify murder suspects and locate fugitives represent a new breakthrough in investigations.

## **POSTER SESSION**

## Discovery of new loci of interest for body fluid identification through DNA methylation melt analysis

Joana Antunes, Quentin Gautier, George Duncan, Bruce McCord, Florida International University

The goal of this project is to identify new loci that present body fluid-dependent DNA methylation patterns, using High Resolution Melt (HRM) analysis. The combination of new and existing loci can allow confirmatory identification of forensically relevant body fluids. DNA methylation is a natural modification in DNA, consisting in covalently attached methyl groups in the 5'carbon of cytosines, typically in a dinucleotide cytosineguanine (CpG) pair.

DNA methylation can be involved in tissue-specific gene expression, thus allowing discrimination between body fluids. Results from commercially available DNA methylation arrays, followed by a PCR-based confirmatory method can identify new loci. Bisulfite-modified HRM analysis can be performed by first bisulfite-converting unmethylated cytosines to uracil, followed by real-time PCR, which converts them to thymines. Methylated cytosines are protected from bisulfite conversion, which provides PCR products with higher melt temperature (TM) when compared to unmethylated DNA. HRM can be a great experimental tool to quickly screen

### ABSTRACTS cont'd

multiple genome locations, and as a standard method in forensic laboratories used to discriminate body fluids.

Bioinformatic analysis of a beadchip array was performed using R studio to identify new CpGs able to discriminate body fluids. Blood, buccal swabs, vaginal and semen samples were collected from volunteers (IRB-13-0555, Florida International University). DNA was extracted using the Bio-Robot<sup>®</sup> EZ1 (Qiagen, CA) and then bisulfite modified using the EpiTect® Fast DNA Bisulfite Kit (Qiagen, CA), according to manufacturer's instructions. Primers were designed using online tools. HRM reactions used either the Epitect® HRM kit (Qiagen, CA) or an optimized master mix on a Rotor Gene 6000 (Qiagen, CA). From the initial list of 150 loci, we were able to identify 4 new loci for blood and vaginal epithelia, which present averages of 67% and 40% difference in DNA methylation between target and other body fluids, respectively. The high throughput of HRM allows for quick screening of new loci and it can also be an analysis tool for casework in forensic laboratories.

#### Benefits and Limitations of Statistical Methodology in Determining Evidentiary Value of Latent Print Identifications

Courtney Mohr, Denver Police Department Crime Laboratory

The process of latent print examination has been challenged in court based on the fact that the decisions made during the latent print examination process typically rely on observational data and on the education and experience of each practitioner. Recent research has highlighted the large variability in the decision-making process among multiple examiners considering the same latent print. Due to the complex nature of pattern evidence, it has been difficult to develop fingerprint statistical models. Academic researchers and practitioners have developed applications to statistically quantify the probability of encountering more than one individual with the same friction ridge feature arrangement. The resulting datasets from these research projects have helped to strengthen the scientific foundations of fingerprint evidence in US courts. The projects have also shown that the availability of a statistical model could assist examiners at each stage of the ACE-V process by providing objective data and documentation for the various decisions made during the process.

The Denver Police Crime Laboratory (DPDCL) partnered with Dr. Cedric Neumann of Two N's Forensics and Assistant Professor of Statistics at the South Dakota State University, to study the practical benefits, limitations and operating requirements of using a statistical model in latent print casework. Latent prints from casework were processed retroactively using Dr. Neumann's model and the data was used to address two research goals. The first goal was to study the benefits and limitations of using objective models to determine the sufficiency of a latent print at the Analysis stage. The second goal was to examine the benefits and limitations of using a statistical model for calculating likelihood ratios (LR) of close non-matches and identifications at the Evaluation stage. Based upon the goals of this 2 project, the following objectives were established: 1. Examine the potential improvement in resource management and work product resulting from the use of fingerprint statistical models in forensic casework. 2. Obtain statistical data to compare the level of agreement between the statistical model and the examiner in determining sufficiency during the Analysis stage. 3. Propose metrics

for assessing the validity of statistical models by comparing likelihood ratios of both identifications and close non-matches as a result of AFIS submissions. 4. Propose guidelines for the operational deployment of fingerprint statistical models in forensic laboratories.

Currently, the data is still being processed by Dr. Neumann. This presentation will highlight the data collection process used by the DPDCL along with the goals and objectives of the research project. The benefits and limitations observed thus far will be addressed, as well as the potential impact on latent print casework.

#### Testing of a Probe Capture Next-Generation Sequencing Assay for Analysis of Nuclear STR and SNP Markers

Tanya Tannous, Shelly Shih, Christian López-Peña, Cassandra Calloway, Henry Erlich, Children's Hospital Oakland Research Institute

DNA from biological samples in forensic casework may be mixed or in degraded condition. In samples with highly degraded DNA, both PCR primer binding sites may not be present on the template DNA fragments, and conventional PCR amplification and Capillary Electrophoresis analysis of Short Tandem Repeats (STR) may fail. Probe capture enrichment utilizes overlapping biotinylated probes to capture fragmented DNA. Since STR regions cannot directly be targeted for capture, DNA regions flanking the STRs were targeted using probe capture enrichment. Previously, we demonstrated that our SNP probe capture/NGS system can capture and sequence DNA fragments as short as 35 base pairs with input as low as 0.5 ng while yielding 99 - 100% reportable SNP genotypes. Reportability is determined by meeting our minimum threshold requirement for read depth of >500 reads per base. Here, we tested the performance of SNP (v3.0) and STR (v1.0) probe capture panels with the same shotgun libraries. Three commercial control DNA samples, 2800 M (Promega, Madison, WI), SRM2391-c (National Institute of Standards and Technology, Gaithersburg MD), and NA24149 (Coriell Cell Repositories, Coriell Institute for Medical Research, Camden, NJ), and 12 blood-derived DNA population samples were prepared using a "shotgun" approach and given unique dual indexed barcode sequences. DNA shotgun libraries were pooled for probe capture enrichment. The enriched products were sequenced on Illumina MiSeq. SNP and STR sequence data were analyzed using NextGENe and GeneMarker®HTS Software. 96% of SNPs (n=496) were reportable using our custom SNP (v3.0) probe capture panel in samples with input amounts of DNA at 25 ng. Some of the STR loci could be analyzed by inspection of the sequence read "pile-ups" with reads that spanned the STR corresponding to the known length variants. This "proof of concept" study with our STR (v1.0) panel identified sequence polymorphisms that would be undetectable by conventional CE analysis. The successful development of probe capture NGS for both STR and SNP assays would provide practitioners an alternative method to PCR amplification for analyzing challenging samples, including highly degraded samples and mixtures.



# **'Happy Attendees'** at the September Northern California Regional Study Group Photos courtesy of Cindy Anzalone



Christina Henry from the Santa Clara Co. Crime Lab and happy attendees at the CSI session.



Nate Overlid from the Solano County Crime Lab and happy attendees at the Blood Alcohol session.



Happy attendees at the Drug session.



Isha Brown from the Alameda County Sheriff's Office Crime Lab at the DNA session.

## CSFS cont'd from page 5

worked with before. Many people in the department had a very difficult time dealing with the aftermath of the shooting. The number of suicides increased in the following years and many people retired due to stress. This event inspired me to speak on the importance of dealing with traumatic and stressful events appropriately, but also immediately, because the additive effects of stress may not come to the surface right away.

On a lighter note, Melissa Moore (2018 Paul Kirk winner) and I attended the CSFS awards banquet during the first night. The suggested attire was black tie and formal dress, and everyone dressed to impress. The first thought that came into my mind was, "Wow, these Europeans are fancy!". I've attended over ten CAC banquets and I don't recall us ever being that dressed up. The night started off with drinks at the bar, a nice 4-course dinner, and guest speaker presentations that reminded me much of our Founder's Lecture presentations. As the CSFS president, Roger Robson, was announcing the awards, I couldn't help but notice that most of the people at our table were receiving awards. I jokingly leaned over to Melissa and said "Technically, we're award recipients too!". Sure enough, the next thing I knew, Roger was announcing an award shared by the California Association of Criminalists and that the past two recipients were here to receive this Joint President's Award. Melissa and I were stunned as we had no idea that we were going to receive an award at this meeting! I guess we were sitting at the "winners" table.

Overall, attending the CSFS Autumn conference was a wonderful experience and I really enjoyed the opportunity to meet and get to know forensic scientists on the other side of the world. I highly encourage those of you who know colleagues who meet the qualifications for the Paul Kirk President's Award to nominate them. And for those who no longer qualify for the Paul Kirk's award, I would highly suggest that you still consider attending one of the CSFS meetings to experience how they do things across the pond.

-Helena Wong



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