Criminalistics Session

Location: Kilimanjaro Ballroom Suite 3

NEAFS	MAAFS
Diana Vargas, Criminalistics Session Chair	Jackson Dimalanta, Physical Evidence Section Chair
	Ashley Stein, Physical Evidence Section Chair-Elect

Thursday, October 8

9:00 am **Opening Remarks**

9:05 am **Effects on skeletonization and skeletal weathering across contrasting annual seasonal cycles.**
Maeghan Fisher and Kristy Henson - Fairmont State University

9:25 am **Comparative Optical Assessment of Natural and Synthetic Latent Fingermarks: Effects of Composition and Storage Conditions on Aging Patterns**
Abigail Grey, B.S., Josep De Alcaraz-Fossoul, PhD - University of New Haven

9:45 am **Assessing Physical Class Characteristics in Burlap Bags**
Elizabeth Leggieri and Ted R. Schwartz, MS - University of New Haven

10:00 am **Break**

10:50 am **Comparative Evaluation of Drip Bloodstain Patterns Produced by Human, Porcine, and Synthetic Blood on Fabric Substrates**
Adam Werwie, Lawrence Quarino, Ralph Ristenbatt III, Andra Lewis - Cedar Crest College

11:10 am **Assessing the Suitability of Commercial Portable Raman Spectrometers for Body Fluid Identification**
Emily B. Tattrie, B.S.[1], Mohamed O. Amin, PhD[2], Pauline E. Leary, PhD[3], Richard Crocombe, PhD[4], Marisia A. Fikiet, PhD[1], Claire L. Glynn, PhD[1], Virginia M. Maxwell, D. Phil[1], Igor K. Lednev, PhD[2], Brooke W. Kammrath, PhD.[1] - [1]University of New Haven, [2]University at Albany, [3]Noble, [4]Crocombe Spectroscopic Consulting

11:30 am **From River to Resolution**
Alyssa Berthiaume, M.S. - Massachusetts State Police Crime Laboratory

12:00 pm **Lunch**

2:00 pm **Collection of Biological and Chemical Threats: Visualizing Effectiveness and Contamination**
Riley P. McCullough, McKenzie Pochiro, Roman P. Karas, Colby E. Ott - FBI/ORISE

2:15 pm **A Presumptive Colorimetric Test for the Identification of Decomposition Material in Soil**
Emily Halpern, McKenzie Pochiro, Colby E. Ott, Christopher A. Tipple - FBI/ORISE

2:30 pm **Canine Detection of Electronic Storage Devices: Determination of Odor Profiles from Electronic Storage Devices Using Mass Spectrometry**
Remi S. Acord, Riley P. McCullough, Emily Halpern, Christopher A. Tipple, Colby E. Ott - FBI/ORISE

2:45 pm **Combined Narrative and Virtual Crime Scene Reconstruction in Forensic Science Education**
Beth Saucier Goodspeed, MS, ABC-BIO and Hailey Garrison, MS - Lasell University

3:00 pm **Subpoenaed by the Syllabus: The Lasting Impact of Forensic Science Professionals in the High School Classroom**
Scott Rubins and Bianca Brandon - New Rochelle High School

3:30 pm **Break**

4:10 pm **Examining the Perceptions of Music Therapy to Address Work Stress for Forensic Professionals**
Jennifer Krizner, B.S., Stephenie Sofield, A.B.D., M.M., M.T.-B.S., Pamela L. Marshall, PhD, Matthew Regentin, M.S., and Lyndsie Ferrara, PhD - Duquesne University

4:30 pm **Where was the shotgun shooter at discharge**
Andrew J. Winter, PhD, Sophia DeSando, Ema Almeida Sanles, Mia Rivera-Diaz, & Peter J. Diaczuk, PhD - New Jersey Institute of Technology

Friday, October 9

9:00 am **Opening Remarks**

9:05 am **50 Years Since Incorporation Some Memories of the First Years of NEAFS**
Thomas A. Kubic , JD, Ph,D., CABC, Founder of NEAFS - John Jay College of Criminal Justice

9:30 am **The Impact of Pre-Wetting on Bloodstain Formation on Fabric Surfaces**
Riley Ocasio B.S. and Peter Valentin PhD - University of New Haven

9:45 am **Building a New Training Program for Friction Ridge Examiners: Lessons Learned and What We Do with the Knowledge We Almost Lost**
Joe Treviño, PhD - NYPD

10:00 am **Break**

10:45 am **Introducing the Forensic Science Research and Training Laboratory (FSRTL)**
An-Di Yim, Emily D Rancourt, Mary Ellen O'Toole - George Mason University

11:15 am **Investigating Trace Element Distribution in Human Cortical Bone Microstructure: The Potential for Individual Identification and Species Discrimination**
Kerri-Ann Matthews - New York University

11:30 am **A Study on Latent Print Processing of Envelopes With Glue-Strips**
Jessica Tarry and Siobhan Brchnel - NYPD Police Laboratory

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Effects on skeletonization and skeletal weathering across contrasting annual seasonal cycles.
Maeghan Fisher and Kristy Henson - Fairmont State University

Human decomposition rates are extremely influenced by weather patterns and carrion activity, which can affect the determination of the postmortem interval (PMI). The objective of this research was to examine how seasonal patterns, such as those in West Virginia, affect skeletal weathering fractures in deer long bones by analyzing them macroscopically in an effort to determine if simulating weather patterns can help determine the PMI. For 30 days, Deer long bones were placed outside for spring, summer, fall, and winter, along with a controlled environment to mimic each season, including UV, precipitation, and temperature. Results showed weathering fractures between simulated samples were not significantly different (p=0.52), while control samples were significantly different (p=0.00004). Macroscopically, bones exposed to UV were bleached and mummified, but invertebrates and mold growth were seen on the control rather than the simulated bones.

Comparative Optical Assessment of Natural and Synthetic Latent Fingermarks: Effects of Composition and Storage Conditions on Aging Patterns
Abigail Grey, B.S., Josep De Alcaraz-Fossoul, Ph.D. - University of New Haven

Natural latent fingermarks (LFs) contain sebaceous and eccrine secretions, whereas “synthetic LFs” (sLFs) may be produced with a molded replica of the original ridge pattern and standard pads that have a water-based composition with no additional biological components. LFs and sLFs from six donors were deposited on glass and plastic surfaces and stored at 4°C and 22°C for up to 25 days. Three-dimensional measurements of ridge height and volume were obtained with an optical profilometer, while two-dimensional ridge clarity was evaluated with the Universal Latent Workstation. This study compared the natural degradation of LFs and sLFs to reveal potentially distinct aging patterns due to differences in chemical and/or biological compositions towards developing objective methods for time-since-deposition (TsDp) estimation.

Assessing Physical Class Characteristics in Burlap Bags
Elizabeth Leggieri and Ted R. Schwartz, MS - University of New Haven

Burlap bags are breathable, durable, and eco-friendly containers that have many uses, including agricultural, industrial, crafting, and, at times, criminal activity. Class characteristics of burlap bags were examined in this study to determine if there are enough to distinguish bags from one another, and to what extent they can be distinguished. Construction features including yarns per inch, yarn diameter, bag color, selvage and seam construction, and extra feature additions such as drawstrings and labels were examined. The various physical features of burlap bags are presented here. These features can help to distinguish one bag from another and may aid in the determination of the brand of the bag.

Comparative Evaluation of Drip Bloodstain Patterns Produced by Human, Porcine, and Synthetic Blood on Fabric Substrates
Adam Werwie, Lawrence Quarino, Ralph Ristenbatt III, Andra Lewis - Cedar Crest College

Considerable research has been conducted to distinguish the differences in bloodstain formation on porous and non-porous surfaces, necessitating the need for separate analytical approaches when examining stains on these surfaces1,2. Comparison between human blood and potential blood analogues has also been extensively studied; however, these studies have almost exclusively been conducted on non-porous surfaces3. To the best of the author's knowledge, no peer-reviewed study has broadly compared blood analogues with human blood on fabric substrates using statistical analysis. Despite this, these analogues continue to be used in subsequent studies on porous surfaces without direct experimental validation. The lack of comparative analysis on fabric substrates remains a key gap, as the intrinsic properties of fabrics (e.g., fiber type, construction, and surface roughness4) may amplify differences between blood types, potentially limiting their suitability.

To address this gap, the present study aims to systematically evaluate and compare the morphological characteristics of drip stain patterns produced by human, porcine, and synthetic blood5 on various fabric substrates, to determine the reliability and limitations of blood analogues for BPA training and research applications on fabrics. Blood was dripped onto four common fabric substrates at controlled drop heights and angles to simulate various real-life drip stain scenarios, and the dimensions, area, and circularity of the resulting stains were measured using ImageJ software. Statistical analyses were conducted to determine if significant differences existed between the analogues and human blood to determine their suitability for use in BPA research and training contexts on fabric substrates. Results indicate differences between human, porcine, and synthetic drip stains, limiting their applicability as analogues on fabrics.

Assessing the Suitability of Commercial Portable Raman Spectrometers for Body Fluid Identification

Emily B. Tattrie, B.S.[1], Mohamed O. Amin, PhD[2], Pauline E. Leary, PhD[3], Richard Crocombe, PhD[4], Marisia A. Fikiet, PhD[1], Claire L. Glynn, PhD[1], Virginia M. Maxwell, D. Phil[1], Igor K. Lednev, PhD[2], Brooke W. Kammrath, PhD.[1] - [1]University of New Haven, [2]University at Albany, [3]Noble, [4]Crocombe Spectroscopic Consulting

Currently, presumptive tests are used at crime scenes to indicate if body fluids are present, but these tests are destructive, produce false positives and negatives, require further confirmatory testing, and each only indicate one type of body fluid. There is a need for a nondestructive, molecularly specific, universal, rapid, and confirmatory method for body fluid identification at crime scenes, all of which are characteristics that Raman spectroscopy possesses. Benchtop Raman spectroscopy has demonstrated its ability to differentiate and identify body fluids (e.g., blood, semen, saliva, urine, and vaginal fluid), causing portable Raman instruments to be suggested as alternatives to presumptive tests for body fluid identification in the field. This research evaluates three commercially available portable Raman spectrometers for their suitability for body fluid differentiation and identification at crime scenes by (1) creating and optimizing a method for different fluid types for each instrument, and (2) creating and testing a spectral library of body fluids on each instrument. This work is intended to enable realization of the potential of body fluid identification using portable Raman instruments, as well as lend support for their use as better alternatives to current presumptive tests used in the field.

From River to Resolution

Alyssa Berthiaume, M.S. - Massachusetts State Police Crime Laboratory

This presentation will follow a homicide from discovery to courtroom resolution. On June 30th 2022, a body was discovered by kayakers in the Connecticut River. Several forensic scientists from the Massachusetts State Police Crime Laboratory responded to crime scenes and processed evidence in the laboratory for this case. This presentation will go into detail regarding the scene analysis and laboratory work and show how collaboration led to a guilty verdict.

Collection of Biological and Chemical Threats: Visualizing Effectiveness and Contamination

Riley P. McCullough, McKenzie Pochiro, Roman P. Karas, Colby E. Ott - FBI/ORISE

Chemical and biological threats pose challenges to both laboratory and on-scene personnel due to the high risk of contamination, transfer, and associated health hazards. Understanding how collection methodologies influence scene contamination and effective collection is critical to developing appropriate protocols and safety precautions. This study explored a comparison between basic collection methods and a bulk-powder vacuum device for collection of material simulating a biological or chemical threat (Bacillus thuringiensis and GloGerm powder). Between-sample and scene contamination was assessed using cultures as well as visualization techniques including UV light and laser light sheet imaging. Understanding particle movement during collection activities is paramount to collector safety and efficacy.

A Presumptive Colorimetric Test for the Identification of Decomposition Material in Soil
Emily Halpern, McKenzie Pochiro, Colby E. Ott, Christopher A. Tipple - FBI/ORISE

Victim recovery canines are a powerful asset for the identification of human remains for forensic searches, disaster efforts, and archeological studies; however, the excavation of the sites identified can be costly and time-consuming, necessitating a secondary confirmation of the presence of human remains. Upon decomposition, biomolecules in human remains break down into smaller functionalized organic molecules, including aldehydes. Aldehydes can be selectively detected with Schiff's Reagent, a tool often used in biological staining. In this work, we describe the necessary methods for the application of Schiff's Reagent to presumptively identify decomposition-containing soil in combination with cadaver dog techniques, demonstrating an evident increase in color vibrancy in comparison to blank controls. This relatively inexpensive and straightforward colorimetric soil test is a useful technique that allows secondary verification of cadaver dog alerts.

Canine Detection of Electronic Storage Devices: Determination of Odor Profiles from Electronic Storage Devices Using Mass Spectrometry
Remi S. Acord, Riley P. McCullough, Emily Halpern, Christopher A. Tipple, Colby E. Ott - FBI/ORISE

Electronic storage devices and the evidence they may contain can be crucial in forensic investigations, but little is known regarding their odor profiles and what compounds the canines trained to detect them are alerting to. Methods were developed to identify these odor compounds using HS-SPME-GCMS—for separation of complex profiles—and DART-TOF-MS—for rapid, high-resolution results. Preliminary studies were conducted on 30+ electronic devices/components—including USBs, SIM cards, circuit boards, cell phones, smart watch, lithium/lithium-ion batteries, RAM sticks, and SD compact flash card—and based on the mass spectral data, their odor profiles were generated. Understanding the odor profiles and what the canines are alerting to is critical to foundational scientific understanding and admissibility. Future work includes adding more devices, observing how changes in devices affect the odor profile, determining if compounds deemed relevant can be detected by canines in the field, and developing an accurate and efficient training aid.

Combined Narrative and Virtual Crime Scene Reconstruction in Forensic Science Education
Beth Saucier Goodspeed, MS, ABC-BIO and Hailey Garrison, MS - Lasell University

The use of virtual reality (VR) technology in science education has become increasingly prominent, focusing primarily on crime scene investigation and crime-lab simulations which leaves lecture-based forensic science courses underrepresented. This study focuses on how an immersive narrative-based reconstruction virtual reality activity influenced several factors in an upper-level "Analysis of True Crimes" course. Pre-and post-experience surveys and an instructor reflection were used in this study to gather data. The results of the qualitative and descriptive analysis will be discussed. The findings of this study suggest that immersive VR experiences may improve contextual understanding and engagement in forensic science courses when introduced thoughtfully alongside traditional-lecture methods.

Subpoenaed by the Syllabus: The Lasting Impact of Forensic Science Professionals in the High School Classroom
Scott Rubins and Bianca Brandon - New Rochelle High School

Forensic science professionals, law enforcement officers, and criminal lawyers frequently interact with students pursuing related studies at the university level, either as adjunct professors, research mentors, thesis advisers, meeting attendees, or guest speakers. However, a unique opportunity exists for these same professionals to inspire the pursuit of college majors in forensic science or criminal justice by collaborating with middle or high school teachers and mentoring their students. Drawing on more than three decades of combined experience as forensic scientists and high school educators, the presenters will demonstrate how meaningful collaborations between practitioners and high school educators enrich classroom instruction and create an authentic experience with real-world applications that engage and motivate students. We will give examples of how forensic professionals have enriched our high school forensic science courses and share practical ideas for establishing partnerships with local schools to inspire the next generation of forensic scientists.

Examining the Perceptions of Music Therapy to Address Work Stress for Forensic Professionals
Jennifer Krizner, B.S, Stephenie Sofield, A.B.D., M.M., M.T.-B.S., Pamela L. Marshall, PhD, Matthew Regentin, M.S., and Lyndsie Ferrara, PhD - Duquesne University

Work stressors, methods to alleviate stressors, and vicarious trauma within the forensic science field have often been overlooked despite the field's specialized and demanding work. Stress affects decision-making accuracy and overall job performance, with unique pressures faced across different demographics of forensic professionals. The purpose of this research was to evaluate the perception of music therapy as a possible intervention to address work stress for forensic professionals. A literature review was conducted to determine the primary work stressors identified by forensic professionals and develop a survey that was distributed to gather information about forensic scientists' perceptions of music therapy. Future work will present all this data to a board of certified music (psycho)therapists to provide realistic pathways for implementing music therapy in forensic workplaces as it may offer a novel, accessible, and evidence-informed option for supporting the well-being of this essential workforce.

Where was the shotgun shooter at discharge
Andrew J. Winter, Ph.D., Sophia DeSando, Ema Almeida Sanles, Mia Rivera-Diaz, & Peter J. Diaczuk, Ph.D. - New Jersey Institute of Technology

Recovery of a fired shotcup or wad at the scene of a shotgun shooting can be very useful and informative evidence. A recovered shotcup can reveal the gauge of the ammunition, the brand of the ammunition, and if properly interpreted, the approximate size of the pellets in the payload. Shotgun ammunition contains five components: the shotshell (which contains everything else), the primer, the propellant, the projectiles (most often multiple pellets) and the wads or shotcup to act as an intermediary between the propellant and the payload. The wads or shotcup are propelled outward with the pellets but due to their light weight and low ballistic coefficient, don't travel anywhere near as far as

the projectiles, which are often made of lead. Consequently, these shotshell components are deposited downrange from the discharging shotgun and with some patience and a keen sense of direction, they can be identified, noted on a sketch of the scene along with distance measurements and brought to the firearm section of the crime laboratory for further analysis.

50 Years Since Incorporation Some Memories of the First Years of NEAFS
Thomas A. Kubic , JD, Ph,D., CABC, Founder of NEAFS
The presenter was the prime mover in the founding of NEAFS, one of the incorporators, the third president and first educational chairman. He will present some history of the earliest years and relate how the organization came to exist.

The Impact of Pre-Wetting on Bloodstain Formation on Fabric Surfaces
Riley Ocasio B.S. and Peter Valentin PhD - University of New Haven

The porous nature of fabrics makes it difficult to apply the copious amounts of existing research on nonporous bloodstain formation, specifically surrounding wetness and moisture content of the staining substrate. When the moisture content is high, due to humidity or weather, during a nonporous surface deposition, the main factors affected are drying time and degradation. When high moisture content is present for porous surfaces like fabric, which can be due to factors like rain or personal activities, it will change the morphology of the bloodstain due to variations in the wicking process, which makes it a crucial and vastly under-researched aspect of bloodstain pattern analysis. This research aims to expand the preliminary studies done on diluted bloodstain morphology by studying a wider variety of fabrics and reinforcing if the distinctive "coffee ring" phenomena is present in various conditions.

Building a New Training Program for Friction Ridge Examiners: Lessons Learned and What We Do with the Knowledge We Almost Lost
Joe Treviño, PhD - NYPD

This presentation covers lessons learned from creating an ANSI/ASB Standard 014-24 compliant training program for Friction Ridge Examiners. This standard provides clarity on the relevant previous guidance (SWGFAST Document #18) and executes a contemporary application of suggestions and recommendations made by previous experts in the past. These suggestions and recommendations often get lost to time if we are not careful to preserve and revisit existing knowledge for our sake and for the sake of our field.

Introducing the Forensic Science Research and Training Laboratory (FSRTL)
An-Di Yim, Emily D Rancourt, Mary Ellen O'Toole - George Mason University

The Forensic Science Research and Training Laboratory (FSRTL) at George Mason University is a five-acre human decomposition research facility that opened in 2021 to address the absence of such a facility in the mid-Atlantic region. Its mission is twofold: to advance understanding of geographic variation in human taphonomy, and to develop practical forensic applications that support federal and local agencies across the Washington metropolitan area. The facility began accepting whole-body donations in 2024 and has received 18 donors to date. Current research spans variation in decomposition rate, progression, and scavenger activity; the role of imaging technology in criminal investigation; and skeletal analysis in forensic anthropology. This presentation introduces the FSRTL and its ongoing research program and invites interdisciplinary collaboration with colleagues across the forensic sciences.

Investigating Trace Element Distribution in Human Cortical Bone Microstructure: The Potential for Individual Identification and Species Discrimination
Kerri-Ann Matthews - New York University

Positive scientific identification of skeletal remains recovered in a medico-legal context is the main objective of forensic anthropology analysis. The focus of this investigation is to explore the application of scanning electron microscopy with energy dispersive X-ray spectroscopy (SEM-EDS) effectiveness in the morphological and chemical characterization of bone microstructure as a possible method of species discrimination (human vs nonhuman) and to obtain an individual's identity if the remains in question are of human origin. To achieve the research objectives of this study, IRB approved midshaft femoral cross-sections from ten non-human mammals (2 pigs, 3 vervet monkeys, and 5 mice) and six humans (5 of Bantu origin and 1 of Australian origin) will be used to create elemental map profiles associated with the composition of their bone microstructure, specifically secondary osteons. Preliminary assessments conducted showed species determination and discrimination can be achieved through multivariate analysis based on BMDD and elemental concentration obtained from both "bright" and "dark" osteons.

A Study on Latent Print Processing of Envelopes With Glue-Strips
Jessica Tarry and Siobhan Brchnel - NYPD Police Laboratory

Envelopes with glue strips that have not been activated are a common substrate received for latent print development. Upon surveying analysts at the NYPD Police Laboratory, it was observed that some analysts considered the glue strip semi-porous and others considered it porous. A comparison study was performed to determine the ideal sequence for processing envelopes with non-activated glue strips.