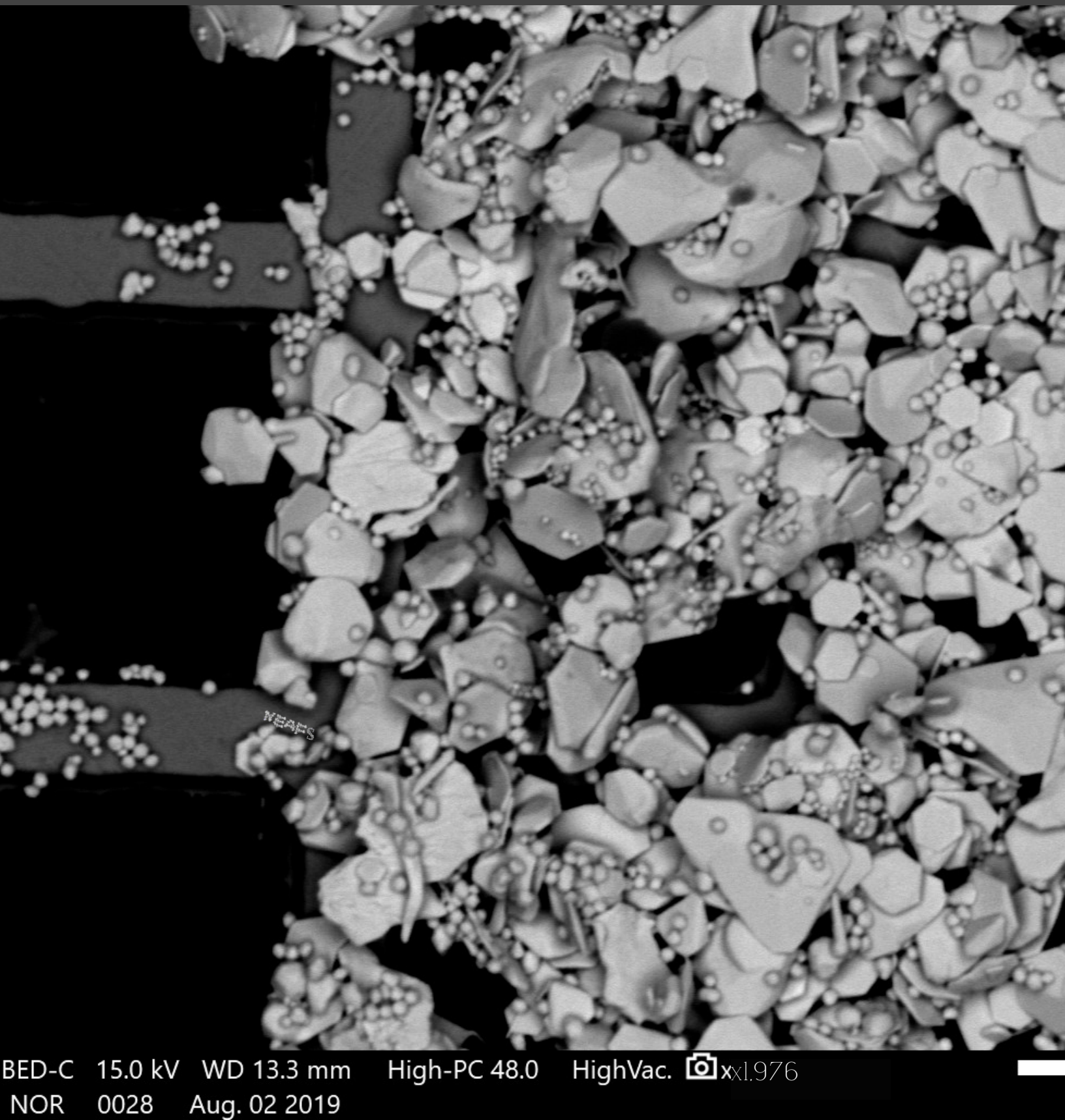
NEAFS Newsletter

Volume 47, Issue 4 Winter 2022



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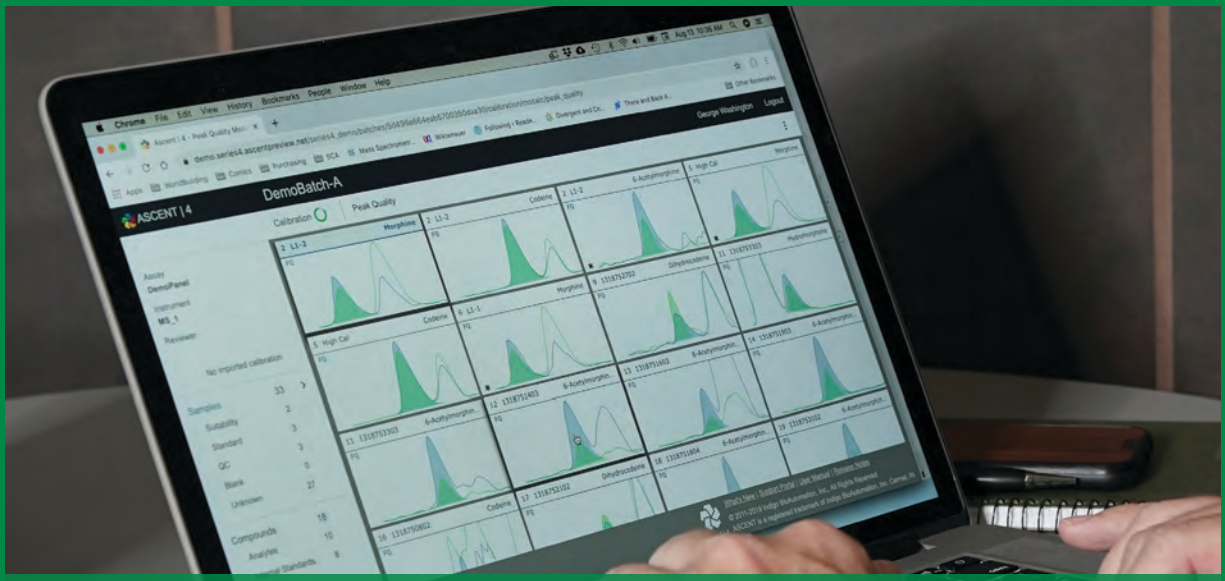

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MEET THE 2022 BOD

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Assistant Professor, Biomedical Forensic Sciences Program Department of Anatomy and Neurobiology Boston University School of Medicine
BA in Chemistry - Stonehill College
MS in Chemistry - Northeastern University
PhD in Analytical Chemistry - Northeastern University

Elizabeth Duval – President-elect
Massachusetts State Police Crime Laboratory since 2009
Forensic Scientist III, DNA Unit Supervisor - 2019 – present
BS Genetics, Texas A&M University
BS in Forensic Science, University of New Haven

Stephanie Minero– Treasurer
Nassau County Office of the Medical Examiner, Division of Forensic Services
Forensic Scientist in the Controlled Substance Analysis Section since 2008
BS in Forensic Science - Long Island University/CW Post
MS in Biology - Long Island University/CW Post

Alanna Laureano- Secretary
Westchester County Department of Labs & Research, Division of Forensic Sciences Since 2007
Forensic Science Specialist and Assistant DNA Technical Leader
BS in Molecular Biology and Biochemistry- University at Albany, SUNY
MS in Forensic Biology- University at Albany, SUNY

Matthew Marino - Director
New Jersey State Police Office of Forensic Sciences, East Regional Laboratory from November 2011 to present
Forensic Scientist 2 in the Drug Unit and Criminalistics Unit
Westchester County, NY Forensic Laboratory from July 2007 to September 2011
Forensic Technician
BS in Natural Sciences with a concentration in Chemistry-St. Thomas Aquinas College

Amanda White - Director
New York State Police Crime Laboratory, FS II- Controlled Substance Analysis from 2019-Present
Westchester County Department of Labs & Research, Controlled Substance Analysis 2016-2019
NYPD Police Laboratory, Controlled Substance Analysis/Latent Print Development 2011-2016
MS Biomedical Forensic Science, Boston University
BS Biology & Anthropology, SUNY Oneonta

Anisha Paul M.S.F.S, D-ABFT-FT - Director
Vermont Forensic Laboratory, Department of Public Safety - Forensic Chemist Toxicology division since 2017
Adjunct professor at Champlain College since 2017
Masters of Science in Forensic Science from Arcadia University
Certified as a Diplomate by the ABFT in the field of Forensic Toxicology

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NEAFS President's Message
Adam B. Hall, Ph.D., ABC-FD

Dear Members of the NEAFS Community-

I'm happy to report that we held a very successful 48 th Annual Meeting in Niagara Falls, NY back in October. I'd like to thank our President-Elect, Betsy Duval for upholding the NEAFS tradition of hosting an excellent meeting for our membership at a very reasonable cost. This meeting was a success due to the tireless efforts of many individuals. I would like to thank all of those who contributed to the success of this meeting from the planning and execution to all of the wonderful presenters of posters, presentations and workshops throughout the week. We wouldn't be able to host such a meeting and keep the cost of attendance low if not for the support of all of the 2022 Annual Meeting Corporate Sponsors.

The board of director's outing on Monday, October 17th was epic and one for the memory bank! I don't think I've ever been so cold and wet with such a big smile on my face as the NEAFS board, staff and I explored the Hurricane Deck at the base of Niagara Falls! On Tuesday we had some excellent workshops as well as the pre-welcome reception. The silent auction was the best we've had to date and I hope we can continue this tradition for years into the future. It's a lot of fun and a great way to earn a bit of additional revenue for the organization so that we can continue to give back to the membership. The scientific sessions began on Wednesday the 19th and certainly did not disappoint. I would like to thank all of the scientific session chairs as well as Matthew Marino for all of their work and organization in making this an essential part of the meeting. As always, the luncheon speaker and the evening session speaker provided us all with an opportunity to reflect upon the important work that we do by our tireless contributions to casework, teaching and research within our field.

NEAFS President's Message
Adam B. Hall, Ph.D., ABC-FD

The Halloween-themed President's Reception was a blast and it was a ton of fun to see so many spirited forensic scientists in costume! Congratulations to all of the award winners as well as this year's winners of the George W. Chin Collegiate Cup Competition. I'd like to especially recognize Janine Kishbaugh as this year's recipient of the Meritorious Service Award. This honor has been years in the making and NEAFS owes Janine a debt of gratitude for all that she has done for our organization over many years to make each annual meeting a resounding success. Congrats again Janine!It's been an honor to have served as your President this past year. I can "retire" knowing that the organization will now be in the fully capable hands of Betsy Duval. I've seen Betsy develop throughout her years of service to NEAFS and I am confident that she will be an effective leader throughout 2023. Happy Holidays to each of you and your families!

As always, an extra special thanks goes out to my wife, Kathryne, and sons Connor, Jameson and Emmett for putting up with me during difficult times, especially when I overcommit myself to professional activities and for being by my side throughout it all.

"In a field of evidential traces, how will you leave your mark?" -A.B. Hall

Please do not hesitate to contact me for any reason in the future: adamhall@bu.edu or pastpresident@neafs.org.

Respectfully Submitted,

Adam B. Hall, Ph.D., ABC-FD
President, Northeastern Association of Forensic Scientists
Assistant Professor, Biomedical Forensic Sciences Program
Boston University School of Medicine

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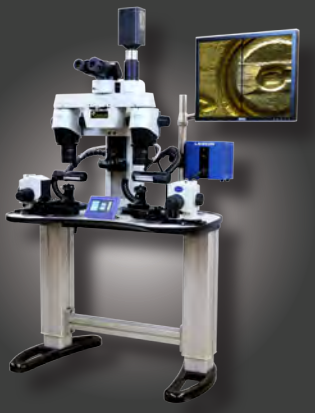

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2023 NEAFS Annual Meeting

November 6th-10th

Mystic Marriott Hotel & Spa

Groton, CT

Questions?

Program Chair Stephanie Minero: presidentelect@neafs.org

NEAFS MOST WANTED

The following individuals are most wanted by NEAFS for the 2023 Annual Meeting in Groton, CT from November 6th-10th.

ADVISORY: They are considered armed with exceptional knowledge and dangerously passionate about Forensic Science:

- **Session Chairs**
- **Peter De Forest Student Competition Judges**
- **Silent Auction Procurement**
- **George W. Chin Cup Competition Volunteers**
- **Registration/Merchandise Volunteers**

Contact Program Chair Stephanie Minero at presidentelect@neafs.org with information.

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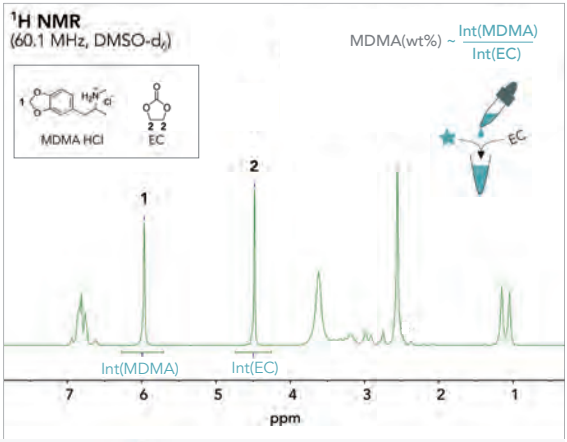

A Generalizable Method

Similar to a ^{1}H qNMR method[1] for MDMA, any illicit drug can be quantified employing any number of suitable, versatile calibrant(s). Here, we used ethylene carbonate (EC) as internal calibrant. The limit of detection (LOD) and limit of quantification (LOQ) were determined to be 0.10 mg/mL and 0.33 mg/mL, respectively.

[1] Frinculescu, A.; Maier, A. F. G.; Shine, T.; Ramsey, J.; Araneda, J. F.; Riegel, S. D.; Frascione, N.; Abbate, V. *J. Pharm. Biomed. Anal.* **2022**, *214*, 114728.

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2023 NEAFS Board of Directors and Staff

The Nominating Committee recommended the following slate of officers to the Board of Directors and an announcement was made to the Membership at the Annual Business Meeting on October 19th, 2022. No additional nominations were received. The terms of office are January 1 through December 31.

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Stephanie Minero

Secretary
Alanna Laureano

Treasurer
Matthew Marino

Directors
Amanda White
Anisha Paul
Sarah Roseman

Past President
Adam Hall

Awards Chairperson
Danielle Malone

Certification Chairperson
Peter Diaczuk

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Corporate Liaison Chairperson
Keri Labelle

Education Chairperson
Sandra Haddad

Ethics Chairperson
Maria Tsocanos

Executive Secretary
Sarah Roseman

Membership Chairperson
Joseph Phillips

Dues
Angelina Pollen

Social Media Coordinator/Merchandise Chairperson
Alyssa Berthiaume

Publications Chairperson
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Beth Saucier Goodspeed

Site Chairperson
Janine Kishbaugh

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We wish all our friends and colleagues the very best for the Christmas season.

2023 will mark our 15th year – supporting the forensic science community with flexible, fit-for-purpose forensic programs.

In 2023 we are expanding our Proficiency Testing program, which is designed to address:

- *ANAB /NATA requirements*
- *Relevance to forensic science facilities*
- *Limitation of potential contextual information*
- *The end -to-end forensic process*
- *Knowledge of the 'ground truth'*
- *Cost affordability*

The program covers the fields of:

- *Biological Criminalistics*
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- *Document Examination*
- *Fingerprint Examination*
- *Digital Forensics*

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MERITORIOUS SERVICE AWARD

AWARDED TO:

JANINE KISHBAUGH

AWARD
2022

I am writing on behalf of Elizabeth Duval to nominate Janine Kishbaugh as the recipient of the 2022 Meritorious Service Award.

Janine has served as the organization's Site Chair since at least 2014, having planned 9 meetings in her tenure with 3 more on the horizon. Each year, Janine drives thousands of miles to visit prospective sites with the current program chair to ensure that each location is fit to hold such wonderful meetings that she helps tirelessly to execute. In addition to site assessments, she drives a hard bargain with the hotel contracts to ensure we receive the best rates possible for food, drink, and lodging.

While at the annual meeting, Janine is the first one up every morning making sure that breakfast is exactly what we ordered and doesn't stop until the very last minute of every day. She must hear her name one million times over the course of those 5 days, as we depend on her to be problem solver, friend, member, and therapist to us.

As an organization, we are indebted to her dedication. On top of all of this – she is a wife, mother, educator, and published researcher.

Stephanie Minero

Northeastern Association of Forensic Scientists

Meritorious Service Award Nomination Form

The Northeastern Association of Forensic Scientists is accepting nominations for the Meritorious Service Award.

This award is given to a NEAFS member that has a history of providing commendable service to the forensic science community by serving justice through casework, performing research advancing forensic science, training and educating forensic scientists and future forensic scientists, and overall contributions to the NEAFS organization. The nominee must have held the status of Regular Member within NEAFS for at least 10 years to be considered.

All nominations must be received by September 1st. The winner of the NEAFS Meritorious Service Award will be announced during the annual meeting.

The Nomination Form can be found on the NEAFS website www.neafs.org.

AWARD
2022

GEORGE W CHIN AWARD

AWARDED TO:

ASHTON MARINI

DUQUENSE UNIVERSITY

"As a senior in a five-year program to earn a Master's degree in Forensic Science and Law, I have high aspirations in the forensics field. A big goal of mine at the moment is to one day be a part of the FBI either as a STEM professional or special agent. I am also attracted to being present at the scene of a crime and to identify and collect evidence, or to handle and work with evidence in general. This upcoming summer I will start my path to reach this goal. I will be participating in an unpaid internship with the Wilmington, Delaware Police Department in the evidence department. I am incredibly excited to get started because this experience will greatly help me learn more about what the future will hold for me. I have already gained a greater understanding of the processes that take place as a forensic scientist, but hands-on experience will be something special.

GEORGE W CHIN AWARD

AWARDED TO:

ASHTON MARINI

DUQUENSE UNIVERSITY

My current forensic knowledge comes from the five-year Master's program at Duquesne University. By the end of this semester, I will have earned a Bachelor of Science in Biology, a minor in Mathematics, and a minor in Biochemistry with a GPA of 3.52. I will then have one more year in the program to earn my Master's in Forensic Science and Law. During my time here, I have collected a few notable achievements and activities that I am very proud of. First, I am the current President of the Duquesne Men's Club Soccer team. With this role, I schedule field time, hire referees and athletic trainers, run practices, control the money available, contact and set up games with other schools, and overall lead by example. I have also played a role in Duquesne's Professional Forensic Science and Law fraternity, Phi Sigma Lambda. I was initiated in 2019 and have not missed a meeting since. Last year, I was nominated and elected to be the fraternity's Professional Fraternity Council (PFC) Representative. During this time, I would attend meetings with other PFC Chairs and discuss opportunities for our members to attend both social and service functions. I would then report this information back to the fraternity president, or directly to the student body. I am currently working on an independent research project which I have titled Source Attribution for Lighter Fluids from Fire Debris. By the end of my five years here, I hope to answer whether different brands of lighter fluid can be individualized using GC-MS analysis after burning on multiple surfaces. This research is important because not much has been done with arson evidence in general, and there is a gap in the field of knowledge that I believe I will be able to fill."

GEORGE W NEIGHBOR AWARD

AWARDED TO:

MEGAN DUNKLE

UNDERGRADUATE STUDENT AT CEDAR CREST COLLEGE

"I am a junior forensic science and biology major with a concentration in pre-med from Cedar Crest College in Allentown, PA. I aspire to have a future career in forensic science as a forensic pathologist. I have always been fascinated with forensic science and how it is applied to criminal cases. Specifically, I find autopsies and the information the human body can hold truly captivating. It is incredible how different pieces of information work together to build an understanding of what occurred and how this can influence a case. That is why I wish to further my education and career in forensic science in order to one day reach my goal of becoming a forensic pathologist. I try to push myself in my academics and my time at Cedar Crest has given me invaluable knowledge and experiences.

GEORGE W NEIGHBOR AWARD

AWARDED TO:

MEGAN DUNKLE

UNDERGRADUATE STUDENT AT CEDAR CREST COLLEGE

During my time at Cedar Crest College, I have been involved in research projects since my first year. These projects have exposed me to numerous lab procedures and helped broaden and enhance my knowledge. I also have been employed by the biology department as a lab assistant. Through these experiences, I have been placed into a mentor role on numerous occasions. Just recently I was able to explain different aspects of my research in order to help further someone else's project. I enjoy helping my peers work through any problems they encounter in and out of the lab. I believe it is important to advise and aid anyone that is struggling. These experiences have also taught me independence and leadership. My current research project requires me to work in the lab by myself and make decisions about how to best proceed with the project. I am also the only current working lab assistant, so all the tasks fall on me to complete. I work hard to ensure the different labs run smoothly and if anything is amiss, I take it upon myself to work in order to fix it. The core values and characteristics I have sharpened during my time at Cedar Crest provided me most recently with an incredible opportunity to intern in the toxicology lab at the Medical Examiner's Office in Philadelphia, PA.

My hard work academically has allowed me to become more involved in my school's various honor societies. I am a member of the Delphi Society, National Chemistry Honor Society, International Forensic Science Honor Society, and most recently the National Biology Honor Society. I take pride in my intelligence and where it has allowed me to go and experience. When the chemistry and forensic honor societies could not find people to fill the roles of officers, I came forward and offered to fill one of these roles. I now hold the title of treasurer in both the National Chemistry Honor Society and International Forensic Honor Society. My leadership capabilities help me perform the requirements of these roles to the best of my abilities."

GEORGE W NEIGHBOR AWARD

AWARDED TO:

KERRI-ANN MATTHEWS

GRADUATE STUDENT AT NYU

"In my future role as a Forensic Anthropologist, I aim to contribute to the analytical techniques that aid in the identification of human remains. Positive scientific identification of skeletal remains recovered in a medico-legal context is the main objective of forensic anthropology analysis. There are many applications of Forensic Anthropology including search and recovery, species determination and assessment of the biological profile which are used to narrow the search of missing persons. Understanding the difference between human and non-human skeletal elements is crucial in these medico-legal investigations. Approximately 20-30% of modern forensic cases involving skeletal remains are determined to be of non-human origin and can represent more than 90% of skeletal cases submitted to medical examiner offices. These percentages emphasize the importance of species identification early on in a forensic investigation to conserve resources and save time. Currently in my role as a graduate student in the Human Skeletal Biology program at New York University, I am focusing my research on species discrimination of fragmentary skeletal remains through histological analysis of the osteocyte lacunae. Frequently when skeletal remains are recovered in a forensic context they are not whole and gross morphological identifying features are absent from the surface of the bone as a result of taphonomical and diagenetic changes. This makes macroscopic analysis of bone difficult, yet other methods involving microscopic techniques can provide a positive identification due to variable skeletal microstructure between species. A subsequent project will include the creation of a machine learning analysis tool that will analyze the microstructure morphology of bone from various species. Ultimately the overall goal of this research/project is to produce a histomorphological tool that can aid in species identification of skeletal remains in a forensic context. Prior to being a graduate student, I became a STEM Curriculum Developer/Instructor for K-12 school programs in New York City. During my undergraduate career, I faced numerous health challenges, causing completion of coursework difficult. Upon graduation, I decided to focus on integrating forensic science, biological anthropology and archaeology into NYC STEM education. I developed and taught a wildlife forensics middle/high school summer camp course at Queensborough Community College. In this science camp, students were introduced to a forensic lab environment, which included facial reconstruction of human skull models and analysis of a mock crime scene on campus. Currently, I helped redesign and teach an online forensic science course for John Hopkins's Center For Talented Youth. The course entitled, Catching the Criminal, teaches students ages 11-13 about types of print evidence and trace evidence. Eventually, students apply this knowledge to solve online mock forensic cases. A parent of one of my students in this course was so impressed by my teaching of forensic content he credited me for sparking his daughter's interest in Forensic Anthropology and asked me to become her mentor. Also, as a Scientist in Residence mentor for the New York Academy of Sciences, I am working on a forensic science themed project with 5th grade NYC students to record changes to animal bones in a pond ecosystem. As a result of my past and present experience in STEM education and my commitment to education and equity for women and girls in the sciences, I was awarded the American Association of University Women Career Development Grant for 2021-2022 to pursue a graduate degree to further my career in the Anthropological and Forensic Sciences. I believe my research interest and past STEM teaching/mentorship of K-12 students embodies the character and work of the forensic scientist whom the NEAFS scholarship was created in memory of. Receiving this scholarship will help me continue my academic career, while also embodying his leadership and professional qualities in the forensic sciences."

STUDENT PRESENTATION COMPETITION WINNERS

AWARDED TO:

ALYSSA SMALE

WEST VIRGINIA UNIVERSITY - GRADUATE

Estimate of the Random Match Frequency of Acquired Characteristics in a Forensic Footwear Database

AWARD
2022

SIERRA SOLETSKY

UNIVERSITY OF NEW HAVEN - UNDERGRADUATE

Examination of Saliva for Determination of a Confirmatory Tests

STUDENT POSTER COMPETITION WINNERS

AWARDED TO:

ALEXA FIGUEROA

UNIVERSITY AT ALBANY-SUNY - GRADUATE

What Came First, the Crime or The Egg? Analyzing Necrophagous Insect Eggs by DART-HRMS for Species Identification

AWARD
2022

NANCY LAY

CEDAR CREST COLLEGE - UNDERGRADUATE

Differentiating Human and Canine Saliva through the Genetic Expression of AMY1 and AMY2

CAROL DE FOREST AWARD

AWARDED TO:

SKYLAR WILLIAMS

CEDAR CREST COLLEGE

Mixture Interpretation of Touch DNA on Common Burglary-Tools Over Time: An Experimental Approach

AWARD
2022

ATTACHMENT A:

Mixture Interpretation of Touch DNA on Common Burglary-Tools Over Time: An Experimental Approach

Introduction, Background and Significance

The recovery of DNA at a crime scene is an essential tool to link a perpetrator to a crime; something as simple as touching an object can attribute to low levels of DNA that are referred to as “touch DNA” (1). The Locard Exchange Principle states that every contact leaves a trace (2). In the absence of large amounts of bodily fluids such as semen and blood left by the perpetrator, touch DNA could be the only way of connecting them to a crime. It is significant to prioritize objects of interest at the scene and understand the DNA profiles on them, as well as when they were deposited.

Sarah Boone was brutally murdered in the basement of her work establishment in 2006. Her death was due to blunt trauma and sharp force as a result of being bludgeoned with a hammer, stabbed with a knife and scissors, and being stomped on. She was engaged, and only 24 years old. Semen was found in her vaginal cavity; however, it was her fiancés and not the person of interest. Main sources of DNA were not applicable so touch DNA on the hammer was analyzed.

Jacuqin Byrd, was the handy man at Boones workplace and her murderer. However, the handle of the hammer with his touch DNA was not used to put him in jail. Since Byrd was the handyman, using the hammer could have placed his DNA on the handle from when he was working (3). Analysis did not allow for the knowledge that it was present on the handle from when the murder occurred. It is essential to better understand touch DNA and its persistence and prevalence over various periods of time. In

order to understand touch DNA better it is necessary to understand what it is composed of.

The anatomy of touch DNA could include cell free DNA, fragment-associated residual DNA, transferred exogenous nucleated cells, endogenous nucleated cells, and anucleate corneocytes (1). The cells coming from the touch are not just the upper layer of the skin cells, other fluids from the body such as saliva, nasal or eye fluid could be transferred to the hand. To further explain, the anucleate corneocytes consist of the outermost layer of epidermis, skin, and will not contribute to significant touch DNA because they have undergone keratinization and lost their nuclei where DNA subsides. The degraded cells and cell free nuclei remain on the hand post cell death subsequent to keratinization occurring. People with drier hands could contribute more of this type of cell residue. Endogenous nucleated cells would be present on the hand and coming from the hand as opposed to coming from other bodily fluids. Exogenous nucleated cells can come from other places on the body, either their own or non-self-DNA. Cell-free DNA could also contribute to touch DNA and is present in sweat, saliva, semen, and urine (1).

Touch DNA recovered is partly dependent on the person who made the deposit, some people leave more recoverable traces than others making them “good” and “bad” shedders. Johannessen *et al.* identified a set of participants as “high shedders” who had at least two DNA profiles with relative fluorescence units that were above average, and their profiles had to be strong with at least 20 of the 24 full loci. However, when comparing different methods to measure this, researchers found that shedder status was different depending on the method used. Overall, cells that are detected do not provide information about DNA quality as it is difficult to know what stage of keratinization they

are in (4). Identifying shedder status can oversimplify the complexity of touch DNA because there are so many variables that impact the deposit made. Phipps *et al*. found that if hands of participants were washed then the non-dominant hand yields better results where unwashed hands yield better results with the dominant hand (5). The personal habits that someone has can contribute to their deposit as well. For instance, if said person touches their face and hair a lot, they could leave a stronger touch deposit (6). The amount of touch DNA left behind could also be related to the surface that it was deposited on.

A surface that is smooth and non-porous could be arguably less sensitive to touch DNA retention as opposed to a porous and rough surface. The rough surfaces could grip touch DNA and essentially pull-out cells encapsulating them in its microscopic grooves (6). The methods used to extract touch DNA are surface dependent. Different methods for extraction include mini taping, swabbing with cotton, polyester, or nylon, and cutting the region of interest which is more applicable to fabrics. An analyst should be familiar with all methods because some work better than others on different surface types. More than one person could handle an object and the DNA transfer could be impacted.

There are different types of DNA transfer, namely direct and indirect. Direct is when the person is depositing their DNA onto a surface without any barriers. In contrast, indirect is when the DNA deposited is transferred again (7). For example, if person A and B were to shake hands then person B was to pick up a pen an indirect transfer of person A's DNA occurred, their profile could be seen on the pen even though they did not touch it themselves. This is important when analysts are looking at DNA profiles and need to determine the people of interest. Surfaces could also contain background DNA which is

when there is DNA present on the surface prior to a significant deposit being made (7). During research, this is accounted for by sterilization of the objects being analyzed prior to being used. The persistence of the deposit with more than one user is what this study is concerned with.

Current research looked at persistence after continued use with various users on different porous and non-porous objects. However, studies have only had periods of time between users ranging from seconds to several days with objects such as tools. This current study will have a primary handler of common burglary tools, such as screwdrivers, and crowbars. A secondary handler will touch the tools ranging from one day up to six months after the primary handler. As the time frame between the primary and secondary user handling a tool widens, the primary user's DNA will likely degrade over time thus making the primary source of touch DNA recovered that of the secondary user depending on time elapsed. Elongating the period between users is beneficial to seeing how long a primary and secondary users profile lasts on an object, and with relation to one another. This could benefit forensic analysts in situations such as the Sarah Boone case. Knowing the lifespan and degradation pattern of a primary user's profile on a tool could help seek justice for those who have been victimized. It is also significant to understand the relationship that time has on DNA mixtures resulting from touch DNA, due to the fact it has major implications in the generation of probabilistic likelihood ratios.

Experimental Procedure

A. Materials

DNA from human subjects, n= 11, will be analyzed in this study. Ten sets of three tools with different handled materials- a carbon steel crowbar (Harbor freight, 69035, 92675, 9701), a crystalline handled screwdriver (Harbor Freight, 92193), and a rubber handled screwdriver (Harbor Freight, 94707, 41269) will be assigned to the participants.

B. Research Design

Participants will be designated as secondary users (ten individuals) and one control primary user. Each secondary user will have 10 time intervals to touch tools in a time frame of 1, 2, 4, and 8 hours as well as 1 day, 1 week, 2 weeks, 1 month, 2 months, and 6 months after the control user has touched the tools. The secondary user will be assigned to touch a new batch of the three tools for every time slot. This will net 30 tools per 10 secondary users, totaling 300 tools. The control (primary user) will handle each tool with both their dominant and non-dominant hand for one minute with moderate grip, totaling two minutes of contact. The secondary users will handle their tools the same way at the designated times.

Each tool will be sterilized under UV light for 25 minutes prior to being handled by the control. To mitigate the risk of external DNA being introduced, all users will wash their hands with soap, dry with a clean paper towel, one hour prior to touching the tools. They will then charge their hands with DNA by rubbing behind their ears with all fingers before touching any tools at the designated time. Storage of the tools between each session will include being placed individually into a brown evidence bag taped shut and placed into the designated storage.

C. Genotyping Workflow

Buccal swabs will be taken from all participants. Tool handles will be swabbed using the microFLQ swabs (Copan, 1721305). Swabs and negative controls will be extracted using QIAmp DNA Investigator Kit (Qiagen, 56504) in a DNA extraction hood.

Touch DNA will be quantified using SYBR-Green-Alu-Based Real-Time PCR (Qiagen, 204143) using the Rotor-Gene 6000 (Corbett, 080607), amplified using Powerplex Fusion (Promega, DC2402), and have libraries created from capillary electrophoresis (ABI 3130) using GeneMapper-IDX software.

D. Mixture Analysis

Probabilistic interpretation of mixtures will be performed using STRmix^{TM} or similar software and changes in likelihood ratios will be monitored over time.

Expected Results and Contribution to Forensic Science

The study hopes to further the understanding of how mixtures generated by DNA are affected over time. As the time frame between the primary and secondary user handling a tool widens, the primary users DNA will likely degrade over time thus making the source of recovered DNA predominantly from the secondary user. However, the results may be influenced on variables such as the surface of the tool and shedder status of the participant on a particular day and linear relationships are not likely. Understanding temporal aspects of touch DNA mixtures may help determine a "window" for when DNA could have been deposited on a surface and has implications in crime scene reconstruction. If, for instance, DNA is found from the primary user in a DNA mixture after a time frame ranging in months then it cannot be assumed that any component of a DNA mixture found is the result of a recent event. How touch DNA

mixtures change over time also has implications in probabilistic genotyping potentially impacting legal considerations.

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ESTIMATED BUDGET:

Product	**Vendor**	**Catalog #**	**Amount**	**Price**	
Rubber handled screwdriver	Harbor Freight	94707, 41269	100	189	
Crystalline handled screwdriver	Harbor Freight	92193	17	50.83	
Carbon Steel Crowbar	Harbor Freight	69035, 92675, 9701	20	199.8	
QIAmp DNA Investigator Kit	Qiagen	56504	1	290.00	
Powerplex fusion	Promega	DC2402	~200 reactions	4,911.00	
microFLOQ	Copan	1721305	3 box	Donated-free	
QuantiTect SYBR Green PCR Kit	Qiagen	204143	1	489.00	
Overall Total				6,129.63	
Requested from NEAFS				$2,500	

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UNIVERSITY AT ALBANY

Biological Stains Identification in Binary Mixtures by Raman Spectroscopy Coupled with Chemometrics for Forensic Applications

AWARD
2022

Biological stains identification in binary mixtures by Raman spectroscopy coupled with chemometrics for forensic applications

I. Introduction:

Traces of body fluids are the primary source of DNA that can provide identifiable information about the victim or perpetrator in a criminal case. As part of an investigation, the DNA source needs to be established, and a series of analyses are required. To facilitate the identification process, presumptive and confirmatory tests are used. Presumptive, also called screening, tests are considered standard qualitative tests that provide an idea of the type of body fluid present in the evidence.[1] Therefore, subsequent confirmatory tests via instrumental analysis are required to confirm the screening test results.[2,3] However, false-positive or negative results in presumptive tests can lead to unexpected results that need further confirmatory tests that consume time and evidence but can also destroy a valuable piece of evidence.[4] These tests can also contaminate the evidence and severely affect further DNA analysis. In sexual assault cases, the body fluids of the victim and perpetrator can become mixed during the crime, resulting in complicated mixtures. However, current screening and confirmatory tests are not designed to simultaneously detect and identify multiple body fluids.[1] Finally, forensic scientists need to consider the potential interference from substrates where the biological stain is present, as well as environmental contaminants from the surroundings.

The proposed project utilizes the capability of sample preservation and Raman spectroscopy's multipurpose approach to identify biological traces in mixed body fluids potentially found at a crime scene. The advantages of this vibrational technique over other existing confirmatory tests can provide a new and more accurate method for bodily fluid analysis in sexual and violent crime investigations where mixed body fluids are commonly found. The substrate interference during the characterization of biological stains found in a real crime scene is one of the challenges a forensic analyst must consider during the investigation. Therefore, our purpose is to evaluate the applicability of Raman spectroscopy in combination with chemometrics analysis to differentiate mixed samples from neat body fluids and analyze the contribution of each body fluid in the sample. The utilization of chemometrics will allow us to isolate the spectral contribution of common substrates and environmental interferences.

II. Background and Significance of research proposed

Collecting biological evidence at a crime scene is imperative for forensic casework. The presence of trace body fluids can provide valuable DNA material which can provide identifiable information about an individual who was potentially involved in the case, which would provide strong evidence in court. To prove or disprove a fact in the case, forensic investigators need to establish the nature of the biological stain.[4] However, crime scene investigators and forensic lab analysts have to consider contamination from multiple body fluids in the stain, from one or more donors, and other environmental factors. For identification purposes, several presumptive tests for each body fluid can provide a notion of the components of the stain but must be conclusively identified through a confirmatory test.[5] A presumptive test employs rapid and straightforward techniques such as colorimetric analysis, which can detect the presence of specific compounds. These preliminary tests are helpful tools for field tests to categorize evidence. Subsequent confirmatory tests are required to verify and accurately measure the presumptive body fluids contained in a biological stain. Contrary to preliminary tests, confirmatory tests require a more extensive and elaborate process that uses instrumental analysis for chemical characterization and quantification. Both of these tests target specific components, or biomarkers, of each body fluid for characterization, such as hemoglobin in the blood, acid phosphatase in semen, or vaginal peptidase in vaginal fluid.[2,3,6,7] Therefore, this type of method is designed to detect one body fluid at a time. However, these body fluid identification tests have some disadvantages when false-positive or negative results are the

outcome of the test. The heterogeneity of body fluids can yield false-positive results due to the multiple biochemical substances they possess or share among them affecting the test. Other disadvantages of these preliminary identification tests are that they are destructive and could be influenced by potential contaminants at a crime scene. Contaminants such as oxidants, catalysts, and other chemicals can interact with the reagents used in the preliminary test. Also, reagents used during the screening test can create interferences, as well as destroy the sample. All of this could lead to the inability to conduct confirmatory testing and DNA profiling.[4,8]

For years, researchers have worked on developing a new confirmatory method that could replace preliminary tests at crime scenes and avoid unnecessary sample consumption. To overcome these disadvantages, a universal, cost-effective, nondestructive, and manageable analysis approach is needed. In an attempt to solve this problem, new spectrometric and spectroscopy techniques have emerged to identify body fluids. Vibrational techniques such as Infrared (IR) and Raman spectroscopy have proven highly efficient for meeting those criteria.[9] Lednev research lab employs Raman spectroscopy as a highly sensitive, nondestructive, and multipurpose technique for analyzing bodily fluid traces.[10, 11] However, Raman spectra of biofluids can be extremely complex due to the heterogeneity and variability within the sample, as well as, its high-dimensional dataset. Additionally, small changes in the spectra are difficult to detect visually. In order to analyze this complex spectroscopic information, multivariate statistical data analysis, or chemometrics, is needed.[12]

Chemometrics is a helpful tool for processing extensive datasets that provide qualitative and quantitative information from the Raman spectra. Its application in forensic science helps investigators with the decision-making of evidence collection and its relevance to the case. It also provides reliable identification of the compounds with statistical support and a confidence level.[13] The identification of body fluid traces has long been applied to vibrational spectroscopic techniques for forensic applications.[9] Dr. Igor Lednev and his group have designed several chemometric models for various forensic purposes, including bodily fluid identification, with numerous articles and even patents. In 2009, Dr. Lednev and Dr. Virkler patented the identification of body fluids using Raman spectroscopy.[8] Here, they presented a method by producing Raman spectroscopic signatures of each body fluid and using them as references for their identification on a statistical model (patent US8467053B2)[14]. Raman spectroscopy has been applied to other forensic and diagnostic areas such as ink analysis on questioned documents,[15] controlled substances,[15] explosive[16] and gunshot residues,[17] art and archaeology studies,[18] and Alzheimer[19] and cancer diagnosis[20]. Lednev's research with body fluid analysis has successfully applied the technique to determine donor age[21], gender[22], race[23], type of specie[24], and sample-aging to estimate the time since a crime took place[25].

Application to more realistic crime scene evidence has also been established. Sikirzhytski et al. studied dry mixtures of semen and blood. Classification of thoroughly mixed samples was done by combining a Support Vector Machine (SVM) regression and SVM discriminant analysis. Cross-validation of the SVM models showed that the lowest detection limit for blood and semen was 5% and 25%, respectively, and mixtures with more than 80% of blood cannot be differentiated from pure blood.[26] Signal interferences have also been examined to identify bodily fluid traces. Also, blood has been positively identified after dust, sand, and soil contamination using the spatial mapping technique and detecting "hot spots" dominated by blood.[27] Another study included the identification of blood and semen on substrates such as cotton, glass, tile, and denim by Raman mapping and spectral subtraction techniques. [28,29] These studies require more extensive laboratory and accurate crime scenario testing to obtain more general acceptance as it is established by the 1923 District of Columbia (293 F. 1013) statute.[30] Under Rule 104(a), the analysis technique needs to be used in the same field conditions, recognized within the scientific community, and the subject of peer-reviewed publications.

III. Experimental procedure

Body fluid samples will be purchased from biological companies or providers (e.g., Lee Biosolutions℠), and different races and genders will be taken into consideration. For this proposed investigation, typical body fluids encountered in sexual or violent crimes that provide DNA material, such as blood, semen, vaginal fluid, and saliva, will be considered. Mixtures of two body fluids will be prepared in aliquots by mass percentage (%m/m) and thoroughly mixed with a vortex for 20 seconds. On a microscope slide covered with aluminum foil (to minimize fluorescence interference), a 10 µL drop of the sample will be deposited and left to dry overnight. Aluminum foil will be substituted with other substrates to study interferences. Measurements will be performed using a Renishaw inVia Raman microscope, calibrated with a silicon substrate prior to each measurement. Parameters of Raman spectroscopy analyses will be modified as necessary for each body fluid. Mapping of the sample using a Prior automatic mapping stage and a 50x microscope objective will be performed at different areas of the sample drop to acquire more information and compensate for the heterogeneity of the sample. Raman spectra will be recorded in the range of 400-1800 cm^{-1}, where body fluids tend to show significant chemical information. A 785 nm laser beam will be used as the excitation light, and the power of the laser will be adjusted between 65 to 130 mW, depending on the body fluid. MATLAB, combined with PLS_Toolbox, will be used for statistical analyses.

Objective 1:

The focus of objective 1 is the identification and discrimination of binary mixtures of bodily fluids. Thoroughly mixed samples will be vortex for 20 seconds in an aliquot, and serial deposition mixtures will be prepared by depositing one body fluid on top of the other. Concentrations (%m/m) of the mixtures will range between ratios of 1:99 to 99:1. The preparation of the sample will be done using a calibrated analytical balance. All samples will be deposited onto a microscope slide cover with aluminum foil for this part of the investigation. The mapping of the sample will be set for 10 seconds exposure time and ten spectra accumulations. Adjustments in the laser power will be made as necessary to prevent photo-degradation of the sample with the laser. Samples containing blood will require a lower laser power to avoid this problem with the blood, but body fluids like semen show higher Raman vibrational signals at higher laser power. Preliminary data has shown that 10% of the original laser power provides a good Raman signal of the mixtures and neat samples.

The development of statistical models will involve supervised and unsupervised data analysis of the spectra. A partial least square discriminant analysis (PLS-DA) will be used to classify samples as mixtures or neat body fluids as a supervised statistical model. To study the chemical composition, independent of sample concentration ratios, an unsupervised statistical model, such as multivariate curve resolution (MCR), will be done using Raman signature spectra of each body fluid. To obtain the signature spectra of each body fluid, principal component analysis (PCA) of neat samples will reduce the dataset, finding correlated variations and providing a smaller set containing most of the information or principal components (PC). After obtaining all the spectral profiles (or signatures) of components in each body fluid, this will be used as a reference in the MCR model and extract the component or target body fluid in the mixtures. MCR analysis could provide each component's chemical composition and concentration profile in the mixture. The identification of the body fluids will be based on their characteristic vibrational Raman bands due to their biochemical composition.

Objective 2:

The primary goal of objective 2 is to expand objective one deposited onto common substrates that could potentially be found at a crime scene. Improvements in the analysis for substrate interferences will be studied during this objective. The contribution of various common substrates found at a crime scene can

interfere with the Raman signal of the body fluids in the wavelength range under study. Therefore, their effect on complicated biological stains can expand this method to a more realistic scenario of crime evidence. For this part of the experiment, the substrates to be considered will be Raman active (vibrational transition of a molecule that undergoes through a change in polarizability during the vibration), such as fabrics, carpets, tiles, and drywall. Sample preparation explained in Objective 1 will remain similar, except for the deposition of the 10 µL drop of the sample because the substrate of microscope slides covered with aluminum foil will be changed. Raman spectroscopy parameters of Objective 1 will be used as the starting point and modified as needed. MCR model will then be applied to differentiate between substrates and body fluids. The model will also be used for body fluid identification using reference Raman spectra. This statistical model will not consider the subtraction of the substrate signal from the Raman spectra, as presented by McLaughlin et al. in 2013. Previous studies with blood and semen on white cotton, glass, glazed bathroom tile, and denim will also be considered as a starting point for this part.

Objective 3:

As a final step, a piece of mock evidence will be fabricated in the lab to simulate a piece of potential crime evidence. This simulated evidence will contain a body fluid mixture on a Raman active substrate with potential environmental contaminants. This potential environmental contaminant will be selected based on conventional materials that could be found at a crime scene. Possible advice will be considered from collaborators of law enforcement and crime laboratories. Some examples of environmental contaminants are dust, dirt, and sand. A small amount of the contaminant will be added on top of the drop of the body fluid before the drop has dried. Spectra will be added to the MCR model to detect and identify the body fluids. PLS-DA model will be used to classify samples between contaminated and uncontaminated samples. Mock evidence will also be tested on aluminum foil to observe the contribution of the contaminant to the Raman signal.

IV. Preliminary Results

The following data are presented to show proof of concept for the objectives proposed. These preliminary results of blood-semen mixtures fall under the first and second objectives. The first step was to identify the differences between the Raman spectra of the neat body fluids and mixtures, as shown in Figure 1, where it was observed that the contribution of hemoglobin and amides I&II are significant in the mixture sample Raman spectra on the area between 1553 to 1654 cm^{-1}. Semen contribution was also observed with bands of Tyrosine and phosphate components present between the 829 to 958 cm^{-1}, as well as Tryptophan at 1342 cm^{-1} in the mixture spectra. Figure 2 results show a correct classification of blood-semen mixtures using Partial Lease Square Discriminant Analysis (PLS-DA) with a 100% specificity and a 99.4% sensitivity of the calibration data set, and 90.1% specificity and 90.3% sensitivity for the Cross-Validation (CV) dataset. A PLS regression model of this dataset shows that a 10:90 %mass ratio had an excellent blood concentration prediction of blood with an R^2 of 0.964 for the calibration dataset and 0.792 for the CV dataset. Accuracy at the lowest blood concentration for the calibration dataset was good, with

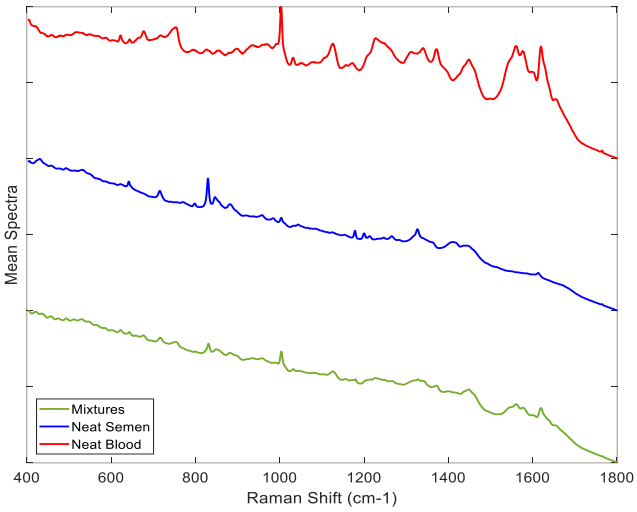

Figure 1. Raman spectra of whole blood (red), semen (blue), and a mixture of blood-semen (green).

only a 9% error. On the other hand, the accuracy of the internal and external CV of blood concentration prediction was low and unsuccessful; therefore, further chemometrics models and validation analyses are being tested.

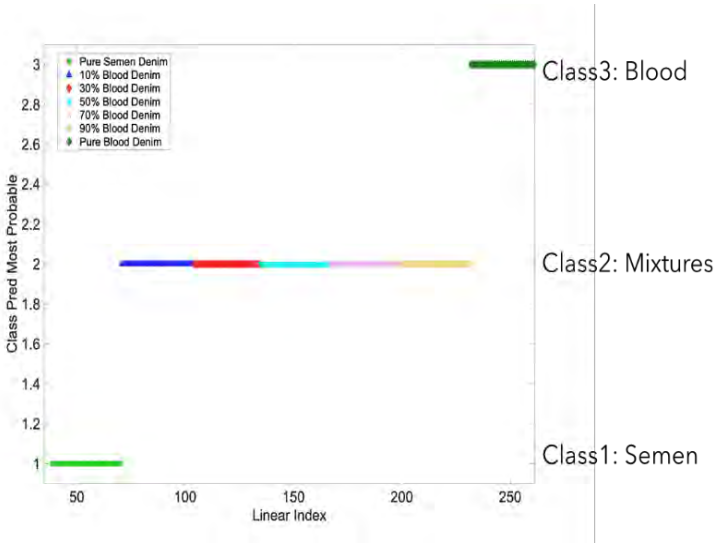

Figure 2. PLS-DA model of different mass ratios of blood-semen mixture deposited on denim fabric.

V. Expected results and contribution to forensic science

The results of this work will have a potentially revolutionary impact on forensic science and criminal justice practice in the United States. The combination of Raman spectroscopy with chemometrics has opened the possibility of expanding and improving this technique for multipurpose applications. This proposed project can help forensic analysts detect and identify mixed biological fluid traces found in criminal investigations on common substrates without compromising valuable DNA material due to the nondestructive technique. It will dramatically reduce sample consumption and time, major instrumentation, sample preparation, human resources, and other financial funds for biological stain identification. The results can also establish a foundation for Raman portable instrumentation and its potential application for at-scene confirmatory test, bypassing unnecessary screening tests reducing the sample identification process, and speeding up DNA profiling. Anticipated results include: (1) discrimination between mixed biological stains to neat body fluids; (2) discrimination of mixed biofluids on common substrates found at crime scenes; (3) provide with a quantitative approach to understanding the contribution of the minor component in the mixtures that could be useful in a courtroom for the comprehension of the data analysis and as a potential reliable scientific the technique, that can support or refute alleged facts in court.

VI. Budget for the project

In order to demonstrate the application of this method for the identification of body fluid mixtures in common substrates, funds are needed to purchase supplies and human biofluid samples. Part of this fund will be used for the 2023 NEAFS Annual Meeting to disseminate my results.

Item	*Average Cost per Item*	*Number of Units*	*Total Cost*
Body Fluids Samples	250	4	1000
Substrates and environmental samples	315	1	315
Microscope slide	152	2	304
Aluminum Foil Tape	26	2	52
Nitrile Gloves	39	5	195
Petri Dishes	192	2	384
NEAFS Conference Annual Meeting 2023	250	1	250
Amount Requested from NEAFS			***2500***

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ATTENTION STUDENTS:

Are you a current full-time undergraduate student in your junior or senior year, or are you either a part-time or full-time graduate student completing his or her degree in a forensic program at a regionally accredited institution located in the Northeastern U.S. (Connecticut, Rhode Island, Massachusetts, New Hampshire, Vermont, Maine, New Jersey, New York, and Pennsylvania)?

Then you are eligible to apply for:

George W. Neighbor Jr. Memorial Scholarship (undergraduate) - Award is $1750
George W. Neighbor Jr. Memorial Scholarship (graduate) - Award is $1750
George W. Chin Memorial Scholarship – Award is $2000

Carol De Forest Forensic Science Research Grants - Award is $2500
***Note** – eligibility is for both full-time undergraduate and graduate students

** **Note –** Two Research Grants will be Awarded.

All submission materials for either the scholarships or the research grants must be completed, and electronically submitted by April 30th. The Awards recipients will be notified no later than September1st.

For more information and Scholarship/Research Grant forms please go to http://www.neafs.org/

Questions or comments? Please email Awards@NEAFS.org

2024 ANNUAL **MEETING**

October 21st, 2024 - October 24th, 2024

Atlantic City, NJ

Contact Info:
Program Chair
Alanna Laureano
secretary@neafs.org

Visit neafs.org under the merchandise tab!

GET YOUR NEAFS GEAR!

TRAINING OPPORTUNITIES

Advanced Fire Debris Analysis for the Forensic Chemist
Tuesday, August 22 through Friday, August 25, 2023

The Bureau of Alcohol, Tobacco, Firearms and Explosives will be offering the Advanced Fire Debris Analysis for the Forensic Chemist course Tuesday, August 22 through Friday, August 25, 2023. The class will take place at ATF's Forensic Science Laboratory-Washington located in Ammendale, Maryland.

This course is designed for analysts working in public forensic laboratories with more than three years of experience in conducting fire debris casework. This course will expand upon the topics covered in the ATF's Introductory Fire Debris Analysis for the Forensic Chemist course, providing additional tools and considerations for fire debris analysis, as well as introducing concepts in fire investigations. The Introductory class is not a prerequisite for the Advanced class. There is no tuition for the course, but participant's agency must cover all travel and per diem costs.

The deadline for submitting an application (*click here*) for the course is April 1, 2023. Applicant's will be notified of their status for the class in May of 2023.

TRAINING OPPORTUNITIES

NORTHEASTERN ASSOCIATION OF FORENSIC SCIENTISTS

2023 TRAINING SCHOLARSHIP FUND

OPEN APPLICATION PERIOD: JANUARY 1st, 2023 - DECEMBER 31st, 2023

APPLICATION REQUIREMENTS

The Northeastern Association of Forensic Scientists (NEAFS) is proud to offer its members a Training Scholarship Fund (TSF). Members in good standing are eligible to receive up to $400 towards training, workshop or non-NEAFS meeting registration and travel expenses. Individuals will only be allowed reimbursement once per application period. Any NEAFS Annual Meeting expenses are ineligible to receive funding. Reimbursement will occur upon receipt of a certificate showing successful attendance and completion of the course along with an article summarizing the course for the NEAFS newsletter.

APPLICATION INSTRUCTIONS

Applicants must submit a *Pre-Approval Application* prior to attending the training for which they wish to obtain funding. All applications must be complete with a brief course description, statement as to how the applicant will benefit from attending the training and justification for receiving funding (i.e. insufficient employer funding or continuing education requirements).

Notification will be given to each applicant upon receipt of the *Pre-Approval Application.* This notification lets the applicant know that their submission has been received by the Awards Chair at NEAFS and is being reviewed. Applicants can expect to be informed of the acceptance or rejection of their application within 60 days of receiving this *Pre-Approval Application* notification.

Upon successful attendance and completion of the training, all pre-approved applicants must submit a *Reimbursement Application* along with supporting documentation. Whenever possible, a certificate should be provided as proof of attendance and completion. If a certificate is not issued, or is unavailable, a letter from the organizer/ instructor verifying the applicant's successful attendance and completion shall suffice. Each Training Scholarship Fund recipient is required to contribute to NEAFS and its members by publishing a written article in the Newsletter. *Reimbursement Applications* will only be considered complete when accompanied by a 1000-word (minimum) course summary.

All application materials can be found on the NEAFS website.

EMPLOYMENT OPPORTUNITIES

Suffolk County Crime Laboratory, Hauppauge, NY
Forensic Scientist II (Biological Sciences)
Salary: approx. $84,000.00

The Forensic Scientist will be responsible for the examination of physical evidence, body fluid analysis, performing DNA-STR (autosomal and Y-STR) analysis, interpretation of data with reporting, and testimony as an expert witness at criminal trials. In addition, the duties may include crime scene response. Applicants should be a currently qualified DNA analyst capable of signing casework reports.

Minimum Qualifications: A Bachelor of Science Degree in Biology, Forensic Science or a closely related field from an accredited college or university; Coursework required by the FBI Quality Assurance Standards For Forensic DNA Testing Laboratories 2020 (Genetics, Molecular Biology, Biochemistry and Statistics); 1) At least four years of Forensic Biology casework experience including DNA-STR (autosomal and Y-STR) analysis, and a current casework signing analyst. Experience with probabilistic genotyping is a plus. Or 2) A Master of Science Degree in Biology, Forensic Science or a closely related field from an accredited college or university may be substituted for one year of casework experience including DNA-STR (autosomal and Y-STR) analysis, and a current casework signing analyst. Experience with probabilistic genotyping is a plus.

For more information, use this link: https://apps2.suffolkcountyny.gov/civilservice/specs/2262spe.html

Contact by email: karen.galindo@suffolkcountyny.gov
Karen Galindo, Forensic Scientist IV
Supervisor, Biological Sciences
Suffolk County Crime Laboratory

Deadline: February 28, 2023

California State University, Los Angeles
Assistant Professor of Criminalistics

The primary professional responsibilities of instructional faculty members are teaching, research, scholarship and/or creative activity, and service to the University, profession, and community. These responsibilities generally include: advising students, participation in campus and system-wide committees, maintaining office hours, working collaboratively and productively with colleagues, and participating in traditional academic functions.

For more information and to apply visit: https://careers.calstatela.edu/en-us/job/520969/assistant-professor-criminalistics

Closing Date: Open until filled

DC Department of Forensic Sciences, Washington, DC
Supervisory Quality Assurance Specialist

The Department of Forensic Sciences (DFS) is seeking a Supervisory Quality Assurance Specialist. The Department's mission is to provide "high-quality, timely, accurate, and reliable forensic science services…[using] best practices and best available technology; a focus on unbiased science and transparency; and the goal of enhancing public safety." The DFS consists of the Forensic Science Laboratory Division, the Public Health Laboratory Division, and the Crime Scene Sciences Division.

The Supervisory Quality Assurance Specialist is responsible for the quality related functions of the agency by addressing the accreditation, quality assurance and certification needs aligned with the service delivery models of the Forensic Sciences Laboratory (FSL), Crime Scene Sciences (CSS) and Public Health Laboratory (PHL) Divisions.

Hyperlink: https://polihire.com/job/supervisory-quality-assurance-specialist

DC Department of Forensic Sciences, Washington, DC
Chief Science Officer (Laboratory Director)

The Department of Forensic Sciences (DFS) is seeking a Chief Science Officer (Laboratory Director). The Department's mission is to provide "high-quality, timely, accurate, and reliable forensic science services…[using] best practices and best available technology; a focus on unbiased science and transparency; and the goal of enhancing public safety." The DFS consists of the Forensic Science Laboratory Division, the Public Health Laboratory Division, and the Crime Scene Sciences Division.

The Chief Science Officer reports to the Director of DFS and provides scientific and project management expertise to identify, address and coordinate forensic science operation initiatives. The Chief Science Officer is also responsible for reviewing and analyzing legislative and policy proposals that affect the department's interest and advises on its impacts.

Hyperlink: https://polihire.com/job/chief-science-officer-laboratory-director

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Boston Police Department, Boston, MA
Criminalist I (Firearms Analysis Unit)

This Criminalist will be assigned to the Firearms Analysis Unit, under the direction of the Unit Director and Senior Examiners. This position may not be assigned all the duties listed, nor do the listed examples include all duties that may be assigned.

Minimum four (4) year bachelor degree in a natural science, forensic science, or closely related field. Entry level apprentice/trainee. No professional experience required. Preference may be given to applicants with forensic or other relevant laboratory experience.

For more information and to apply, visit https://social.icims.com/viewjob/po1667497340897b3b37#.Y2P9gIhXC6Y

Johnson County Sheriff's Office Criminalistics Laboratory, Olathe, KS
Forensic Scientist – Firearms & Toolmarks Section
Pay Range $49,437 - $92,926, depending on experience and level at which hired

The Johnson County Sheriff's Office Criminalistics Laboratory is seeking qualified applicants to fill an open position in our Firearms & Toolmarks Section. The major duties of this position include, but are not limited to:
• Conduct function tests on submitted firearms, perform serial number restorations
• Perform microscopic comparisons of ammunition components and toolmarks
• Enter and review correlations in the NIBIN database system
• Perform technical and administrative review of case data
• Document and perform casework duties in accordance with laboratory procedures with minimal errors and no pattern of deficiencies
• Assist in ensuring conformance to laboratory accreditation standards
• Provide expert testimony in courts of law as required

This position requires availability for on-call hours outside the normal workday, including evenings, weekends, and holidays.

Graduation from an accredited college or university with a minimum of a bachelor's degree. A degree in biology, chemistry, other natural science, or forensic science-related area with coursework in physics, statistics, and general chemistry is preferred. Transcripts must be submitted with the application to verify degree requirement. Experience may be substituted for degree requirement. At least two years of recent independent casework experience in the relevant discipline.

Link: https://www.jocogov.org/department/human-resources/careers-johnson-county-government/positions-open-public

John Jay College (CUNY), Department of Sciences – New York, NY
Assistant Professor in Criminalistics

The Department of Sciences is seeking a tenure-track faculty member with advanced expertise in Criminalistics/Physical Evidence Analysis. Applicants should possess a Ph.D. in Forensic Science or Criminalistics or relevant fields such as Analytical Chemistry, Physical Chemistry, Geology, Imaging Science or Materials Science with research expertise in forensic science. Equivalent experience in the area of Criminalistics or a closely related field, especially in evidence traces with micro and ultra-micro analysis methods at the federal, state, local or private level would be considered. John Jay College of Criminal Justice, a senior college of the City University of New York (CUNY), is an internationally recognized leader in educating for justice, committed to the advancement of justice and just societies. The Department of Sciences retains highly respected and internationally recognized faculty with a wide range of expertise in both the physical and biological sciences and in specific forensic disciplines. Please see the links below for more details regarding the position.

Link for job posting: https://www.jjay.cuny.edu/employment-opportunities
Job ID: 25286