



2026 GRADUATE RESEARCH SYMPOSIUM

Forensic Science & Law

MARCH 20 & 27, 2026



**DUQUESNE
UNIVERSITY**



If you wish to join in person:

Join us at:

Duquesne University in Pittsburgh, PA

The symposium will be held in:

Rockwell Lecture Hall 1



If you wish to join via Zoom:

Click this link to join:

[https://duq.zoom.us/j/96055243530?](https://duq.zoom.us/j/96055243530?pwd=fscgApza5ATfTL8bvWy9eDDWc2pKVJ.1)

[pwd=fscgApza5ATfTL8bvWy9eDDWc2pKVJ.1](https://duq.zoom.us/j/96055243530?pwd=fscgApza5ATfTL8bvWy9eDDWc2pKVJ.1)

Meeting ID: 960 5524 3530

Passcode: forensic





F r i d a y , M a r c h 2 0 t h , 2 0 2 6

Rockwell Hall Lecture Hall 1

12:00 PM - 4:15 PM

12:00 PM - Analyzing the Effects of Environmental Conditions on the Firing Pin Toolmark Impressions on Cartridge Cases

Morgan Czyzyk

12:30 PM - Determination of Assembly Time of 80% Firearms and Subsequent Operability

Elisabeth Smith

1:00 PM - Enhancing Forensic Toxicology Through Post-Mortem Applications: Evaluating the Viability of Skin Swabbing as a Drug Testing Matrix

Hannah Schaeffer

1:30 PM - Utilizing Forensic Pathology Slide Sorting to Support Cold Case Resolutions in Pennsylvania

Katherine Scheller

2:00 PM

BREAK

2:15 PM - A Field-Ready Method for Wildlife Identification Using Noninvasive Genetic Sampling and Nanopore MinION Technology

Rosemary van der Net





Friday March 20th, 2026

Rockwell Hall Lecture Hall 1

12:00 PM - 4:15 PM

2:45 PM - Degradation and Stability of THC Standards in Oral Fluid Using LC-QQQ-MS

Kendall Michaels

3:15 PM - Determination of Gunshot Residue to Mimic an Explosives Detection Canine Training Aid Using GC-MS

Jessica Dudich

3:45 PM - Discerning Prompt-Based Artificial Intelligence Generated Images from Real Photos

Dylan Stype

Forensic Science & Law





Friday, March 27th, 2026

Rockwell Hall Lecture Hall 1

12:00 PM - 3:45 PM

12:00 PM - A Comparison of the Resilience of Bulletproof Backpacks with Level IIIA Body Armor and Varying Contents Against 0.223 Rifle Rounds

Melanie Tanis

12:30 PM - Developing a Cost-Effective CRISPR-Based Detection System for the Trout Gill Louse *Salmincola edwardsii*

Kara Young

1:00 PM - Survivability of Fingerprints on Metal Surfaces After Heat and Flame Exposure

Loreniz Colom

1:30 PM - Compatibility of Latent Print Processing Methods with LC-QQQ-MS Detection of Trace Drug Residues

Jessica Pichat

2:00 PM

BREAK

2:15 PM - Time Since Intercourse and Serological Testing in Sexual Assault Homicides: A Case Report and Brief Review of the Literature

Peyton Byers





Friday March 27th, 2026

Rockwell Hall Lecture Hall 1

12:00 PM - 3:45 PM

2:45 PM - CODIS, We Have a Problem: Addressing the
Gap Between CODIS and Lawfully Owed DNA

Julia Moorhead

3:15 PM - The Effects of Synthetic Substrates on DNA
Degradation and Inhibition Using Blood Exposed to
High Temperatures

Janae Chase

Forensic Science & Law





Friday March 20th, 2026

Rockwell Hall Lecture Hall 1

Abstracts:

Morgan Czyzyk Analyzing the Effects of Environmental Conditions on the Firing Pin
12:00 PM Toolmark Impressions on Cartridge Cases

Environmental exposure can alter cartridge cases recovered from crime scenes, causing corrosion and surface damage that obscure toolmark impressions and complicate forensic identification. While prior studies have examined breech face impressions, limited research has focused on firing pin impressions. This study evaluated the effects of soil, water, and combined soil and water exposure on firing pin toolmark impressions of 9mm brass cartridge cases over five months. Forty-five cartridge cases were distributed across the three environments, with three controls retained. After exposure, impressions were examined using a comparison microscope. Three cleaning methods—acetone, synthetic oil, and citric acid—were also tested for their ability to restore obscured toolmarks. Results indicated that combined soil and water produced the highest number of inconclusive findings, and all cleaning methods performed similarly and reduced the amount of inconclusive results. These results aim to improve examination procedures for environmentally compromised ballistic evidence and increase reliable identifications.

Committee Members: Lyndsie Ferrara, Ph.D., Anita Lorenz, M.S., *Matthew Regentin, M.S.*

Elisabeth Smith Determination of Assembly Time of 80% Firearms and Subsequent
12:30 PM Operability

Privately Made Firearms (PMFs) have been a growing concern within the field of forensic science due to their accessibility and ease of assembly from commercially available kits. Often called “80% kits,” the partially finished components could be converted into fully functional firearms with minimal tools and experience, yet limited research has evaluated the true difficulty of this process. This study investigated the level of expertise required to complete 80% firearm kits by having participants with varying levels of firearms knowledge manufacture them under controlled conditions. Participants were evaluated on three parameters: the time required to manufacture the firearm, the functionality and accuracy of the finished firearm, and the amount of guidance needed throughout assembly. By analyzing the practical challenges of producing PMFs, this research aimed to enhance law enforcement understanding of PMFs manufacture, inform investigative practices, and support efforts to estimate the frequency of PMF assembly and distribution.

Committee Members: Caitlin Baker, M.S., Anita Lorenz, M.S., John A. Viator, Ph.D.,
Matthew Regentin, M.S., Pamela Marshall, Ph.D.



Hannah Schaeffer Enhancing Forensic Toxicology Through Post-Mortem Applications:
1:00 PM Evaluating the Viability of Skin Swabbing as a Drug Matrix

This study examined the viability of utilizing skin swabbing as a potential matrix for the extraction, detection, and quantification of drugs present within samples collected post-mortem. While this introduces a potential gap in the field, it is hypothesized that findings will be reciprocal to living subjects. The viability of the skin swabs was assessed through a comprehensive statistical analysis and compared to established toxicological matrices by effectiveness, testing duration, and cost efficiency. Nine samples were each collected from four suspected overdose decedents (n=40) at local county coroner's offices: four skin swabs, two oral fluid swabs, one vitreous humor, one blood, one urine. Each matrix underwent a solid-phase extraction method. The LC-QQQ-MS was used in conjunction with Dynamic Multiple Reaction Monitoring (dMRMs) to detect seven target drugs: alprazolam, benzoylecgonine, fentanyl, methamphetamine, 6-monoacetylmorphine, morphine, oxycodone. Results reveal skin swabbing as a viable matrix for a noninvasive and cost-effective method of drug testing.

Committee Members: Abigail Burke, M.S., Jennifer Hammers, D.O., Rebecca Wagner, Ph.D.,
Stephanie J. Wetzel, Ph.D.

Katherine Scheller Utilizing Forensic Pathology Slide Sorting to Support Cold Case
1:30 PM Resolutions in Pennsylvania

Cold cases are unresolved criminal investigations suspended due to a lack of viable leads. More than 200,000 cold cases remain open in the United States, leaving families without closure and communities without answers. Advances in forensic science provide new opportunities to reexamine archived evidence using modern techniques. This research initiative supports cold case investigations in Pennsylvania by evaluating archived forensic pathology slide samples for their potential contribution to case resolution. An active cold case list was obtained from the Westmoreland County District Attorney's Office in Pittsburgh, Pennsylvania. Each case was cross-referenced with corresponding autopsy slides stored at the Westmoreland County Coroner's Office. In collaboration with lead investigators, cases were assessed for the suitability of evidence for further forensic testing. By integrating archival pathology materials with forensic methods, this study seeks to generate new investigative leads. This approach serves as a scalable model for broader implementation statewide and beyond.

Committee Members: Jennifer Hammers, D.O., Stephanie Santiago, D-ABMDI, *Pamela Marshall, Ph.D.*



Rosemary van der Net **A Field-Ready Method for Wildlife Identification Using
2:15 PM Noninvasive Genetic Sampling and Nanopore MinION Technology**

Genetic sampling can provide diagnostic identification of species and individuals, creating great potential for forensics and solving wildlife crimes (Srivathsa et al., 2021). Wildlife crime often occurs in remote areas, which lack officers and eyewitnesses, making the use of DNA evidence crucial. While traditional DNA extraction kits are effective, they often require extensive equipment and time, and are limited in throughput, making them impractical for field deployment. This study explores the use of Nanopore MinION technology, a portable DNA sequencer, in combination with a novel field-friendly DNA extraction protocol to streamline wildlife genetic analysis. The objective was to develop a time-efficient and scalable DNA extraction method suitable for field conditions, capable of processing multiple scat samples simultaneously, and compatible with MinION sequencing. A practical field test confirmed the effectiveness of this method, and results suggest the proposed methodology will cut down time of analysis whilst increasing throughput, proving it a valuable method for fieldwork.

Committee Members: Joshua Robinson, M.S., Joseph Saxfield, B.S., Pamela Marshall, Ph.D., *Jan Janecka Ph.D.*

Kendall Michaels **Degradation and Stability of THC Standards in Oral Fluid Using
2:45 PM LC-QQQ-MS**

Tetrahydrocannabinol (THC) has been legalized in states across the country for medical and recreational usage. With legalization came the increase in usage, purchases, and driving under the influence of drugs (DUID). Law enforcement has not introduced a validated method of on-site THC testing and brings their samples to a lab to be tested. This results in inaccurate concentrations at the time of driving. This research hypothesizes that the degradation of THC standards in oral fluid will increase within seven days. Oral fluid samples with $\Delta 8$ -THC, $\Delta 9$ -THC, and $\Delta 10$ -THC underwent solid phase extraction, followed by liquid chromatography triple quadrupole mass spectrometry that assessed the degradation of the samples over 7 days. The concentration of THC in oral fluid decreased over the 7-day period indicating degradation supported by statistics. These results support on-site DUID testing is necessary to accurately determine THC concentration at the time of driving.

Committee Members: Colette Salerno, M.S., Lyndsie Ferrara, Ph.D., *Stephanie J. Wetzel, Ph.D.*



Jessica Dudich **Determination of Gunshot Residue to Mimic an Explosives**
3:15 PM **Detection Canine Training Aid Using GC-MS**

Firearms and explosives related crimes continue to persist and recovering discarded weapons is an ongoing problem for law enforcement. Leaving firearms unattended in large, open training environments has associated risks, such as losing the firearm or someone else finding it. In the absence of information regarding training methods, canine handlers have adopted different approaches to mimicking an open area search for a firearm. The purpose of this study was to determine the amount of residue on the firearm to facilitate future development of a training aid. GSR swabs were obtained from swabbing a Glock 43X with isopropanol using varying shots fired. Swabs were analyzed GC-MS with EGDN and NG acting as standards. Due to the combination of the processing method and the limit of detection of the instrument, quantitation of nitroglycerin was not achieved. However, this study provides information that can be utilized when developing a future canine training aid.

Committee Members: Julie Pannuto, B.S., Stephanie J. Wetzel, Ph.D., *Matthew Regentin, M.S., IAAI*

Dylan Styne **Discerning Prompt-Based Artificial Intelligence Generated**
3:45 PM **Images from Real Photos**

The rapid advancement in the field of generative artificial intelligence (AI) image generation has raised concerns about the ability of the public to differentiate real photos from synthetic images, which can be used for several illicit activities such as fraud, falsifying evidence, and extortion. A survey was designed to ascertain participants' ability to identify true image origin and determine the factors that influence their decision. Also, reasoning responses were recorded and analyzed to determine common themes that led to participants' decisions. Additionally, three current online AI image detectors developed to identify the origin of an image were evaluated. The survey indicated that participants could correctly identify an image's origin with about 61% accuracy on average and raises concerns for human detection as a reliable identification technique. The accuracy of the online AI image detectors varied, and there were limitations with many; however, one made zero misidentifications.

Committee Members: Matthew Regentin, M.S., Lauren Sugden, Ph.D., *Lyndsie Ferrara, Ph.D.*





Friday March 27th, 2026

Rockwell Hall Lecture Hall 1

Abstracts:

Melanie Tanis A Comparison of the Resilience of Bulletproof Backpacks with Level
12:00 PM IIIA Body Armor and Varying Contents Against 0.223 Rifle Rounds

With the rise of school shootings, bulletproof backpacks with Level IIIA ballistic protection have become commercially available. These backpacks are rated as protective against handgun ammunition, however this study focuses on testing the protective abilities of these backpacks against higher velocity 0.223 caliber rifle ammunition with varying amounts of school supplies (laptops and notebooks). To analyze the damage and penetration of the ballistic plate, layers of the material were peeled back to determine the layer that served as the final block for the projectiles. The backpacks were analyzed using the stereomicroscope to measure the size of the entrance and exit pathways of the projectile. Trials had varying levels of damage to the ballistic plate based on the contents and ammunition. This research aims to improve safety measures in schools and increase the awareness of protective measures students can take to potentially decrease the casualties of these mass shooting events

Committee Members: Ryan Rennig, Special Agent, Stephanie J. Wetzel, Ph.D., *Matthew Regentin, M.S.*

Kara Young Developing a Cost-Effective CRISPR-Based Detection System for the
12:30 PM Trout Gill Louse *Salmincola edwardsii*

Brook trout are parasitized by *Salmincola edwardsii*, a copepod known commonly as gill lice. Monitoring parasite larvae and shed eDNA by molecular methods can increase detection sensitivity, use non-invasive water samples, and monitor streams and hatcheries throughout the parasitic life cycle. Here, we develop a CRISPR-based detection system that uses minimal equipment and can be made field deployable to detect *S. edwardsii*. Our assay amplifies a 166 base-pair region of the cytochrome c oxidase I gene. The amplicon is subjected to a CRISPR-Cas12a enzyme programed with a gRNA specific to the parasite. Upon contact with parasite DNA, the Cas12a enzyme activates, cutting single-stranded DNA in the reaction tube, including a reporter that fluoresces under UV light. Future work will involve replacing lab PCR with Recombinase Polymerase Amplification to develop a Field-deployable, Isothermal Nucleotide-based Detection Method (FINDeM) to assay water samples for identification, population dynamics and dispersal for this devastating parasite.

Committee Members: Andrea Kautz, M.Sc., Pamela Marshall, Ph.D., *Brady Porter, Ph.D.*





Loreniz Colom
1:00 PM

**Survivability of Fingerprints on Metal Surfaces After Heat
and Flame Exposure**

Latent fingerprints are critical forensic identifiers, yet their survivability in fire environments is not fully understood due to the complex effects of heat, soot deposition, and heat transfer. This study evaluated the recoverability of fingerprints deposited on metal surfaces following exposure to controlled kiln heating and direct flame conditions simulating arson scenarios. Prints from multiple donors were subjected to high temperatures for varying durations and developed using black powder, magnetic powder, and cyanoacrylate fuming with fluorescent dye staining. Results demonstrated that fingerprints can persist on metal surfaces after short-term, high-temperature exposure, including brief flame contact. Across conditions, cyanoacrylate fuming followed by fluorescent dye and alternate light source examination consistently produced the most suitable ridge detail for identification. These findings suggest that transient high-temperature events, such as flash fires or explosions, may still allow successful fingerprint recovery and provide practical guidance for processing fire-damaged evidence in arson investigations.

Committee Members: Jason Clark, M.S., CLPE, CSCSA, William P. Davis, B.S. & GCERT, IAAI-CFI, Matthew Regentin, M.S., IAAI-CFI

Jessica Pichat
1:30 PM

**Compatibility of Latent Print Processing Methods with
LC-QQQ-MS Detection of Trace Drug Residues**

Latent prints are the most common type of fingerprints found at crime scenes and require processing to visualize friction ridge detail (FRD). Consequentially, fingerprint processing may destroy trace evidence, such as chemical substances transferred from the finger to the print. Prior research has established the ability to detect drug residues from undeveloped latent fingerprints. However, minimal research has analyzed the effects of fingerprint processing on drug detection. This research qualitatively examined the detection of over the counter (OTC) drugs by liquid chromatography triple-quadrupole mass spectrometry (LC-QQQ-MS) from developed latent prints. Black powder, magnetic powder, ninhydrin, 1,8-Diazafluoren-9-one, and cyanoacrylate fuming processing methods were utilized to develop drug contaminated fingerprints. It was found that the presence of drug residues decreased FRD quality. And more importantly, that the processing methods had little to no effect on detection, indicating that drug chemistry can be utilized to detect drugs from fingerprints that have undergone processing.

Committee Members: Ashley Ebert, Ph.D., Lyndsie Ferrara, Ph.D., Stephanie J. Wetzel, Ph.D





Peyton Byers

2:15 PM

Time Since Intercourse and Serological Testing in Sexual Assault

Homicides: A Case Report and Brief Review of the Literature

Underwear and time-since-intercourse (TSI) intervals are critical evidence in sexual assault cases, enabling serological testing, DNA profiling, and visual inspection to support testimony and reconstruct events. Research shows male DNA is frequently recovered from handled areas such as bra straps and underwear sides (Roersma, R., et al. (2024)). However, limited studies address precise seminal fluid deposition patterns in decedents. Although seminal fluid can be detected in underwear, its forensic interpretation remains underexplored (Jones, S., et al. (2024)). This study examined a sexual homicide in which a female victim was found lying on her left side, with seminal fluid confined to the left inner gusset of her underwear. Due to scarce research on underwear stain patterns, interpretation was initially ambiguous. The case was evaluated considering body position, TSI intervals, and gravitational drainage. The findings emphasized forensic importance of stain pattern analysis and highlighted research gaps in understanding seminal fluid distribution in sexual homicide investigations.

Committee Members: Lyndsie Ferrara, Ph.D., Julie Sikorsky, M.S., *Pamela Marshall, Ph.D.*

Julia Moorhead

2:45 PM

CODIS, We Have a Problem: Addressing the Gap Between

CODIS and Lawfully Owed DNA

Since the 1990s, the Combined DNA Index System (CODIS) has evolved into a powerful forensic tool for linking DNA profiles to criminal investigations. Among the 26 million profiles in CODIS, there are DNA samples from individuals convicted of qualifying offenses, referred to as lawfully owed DNA (FBI, 2025, Lovell, 2022, Ortyl, 2019). When these profiles are missing, it can potentially hinder the resolution of cold cases and other crimes. This research explores the possible reasons behind the absence of DNA profiles in CODIS. Potential contributing factors occur during the initial collection phases and include inconsistencies in collection procedures, limitations in retroactive DNA collection laws across states, and failure to follow up on CODIS hits. This study investigates the systemic gap between lawfully owed DNA and its implied absence from CODIS, with a focus on Pennsylvania. Addressing this gap could enhance the effectiveness of CODIS, support criminal investigations, and ensure justice is served more consistently.

Committee Members: Rockne Harmon, J.D., Ashley Platt, M.S., *Pamela Marshall, Ph.D.*





Janae Chase
3:15 PM

The Effects of Synthetic Substrates on DNA Degradation and Inhibition Using Blood Exposed to High Temperatures

The widespread use of synthetic household materials presents challenges in fire-related forensic investigations. These materials combust more rapidly than traditional substrates, increasing the risk of flashover and potentially degrading or inhibiting DNA, which complicates recovery and analysis. Despite their prevalence, limited research has examined how synthetic materials affect DNA following fire exposure. This study evaluated the extent to which synthetic substrates contribute to DNA degradation and inhibition at elevated temperatures using human blood as the DNA source. Blood was deposited on synthetic and non-synthetic materials and exposed to radiant heating ranging from 91 °C to 223 °C. It was hypothesized that synthetic materials would produce higher degradation indices (DI) and greater stochastic effects compared with their non-synthetic counterparts. However, results showed minimal differences in overall DNA degradation or inhibition between substrate groups across the tested temperatures. Additionally, electropherogram data indicated varying degrees of degradation in both groups.

Committee Members: Pamela Marshall, Ph.D., Lyndsie Ferrara, Ph.D., Rhonda K. Roby, Ph.D., M.P.H., ABC-DNA, Matthew Regentin, M.S.

END OF SYMPOSIUM

