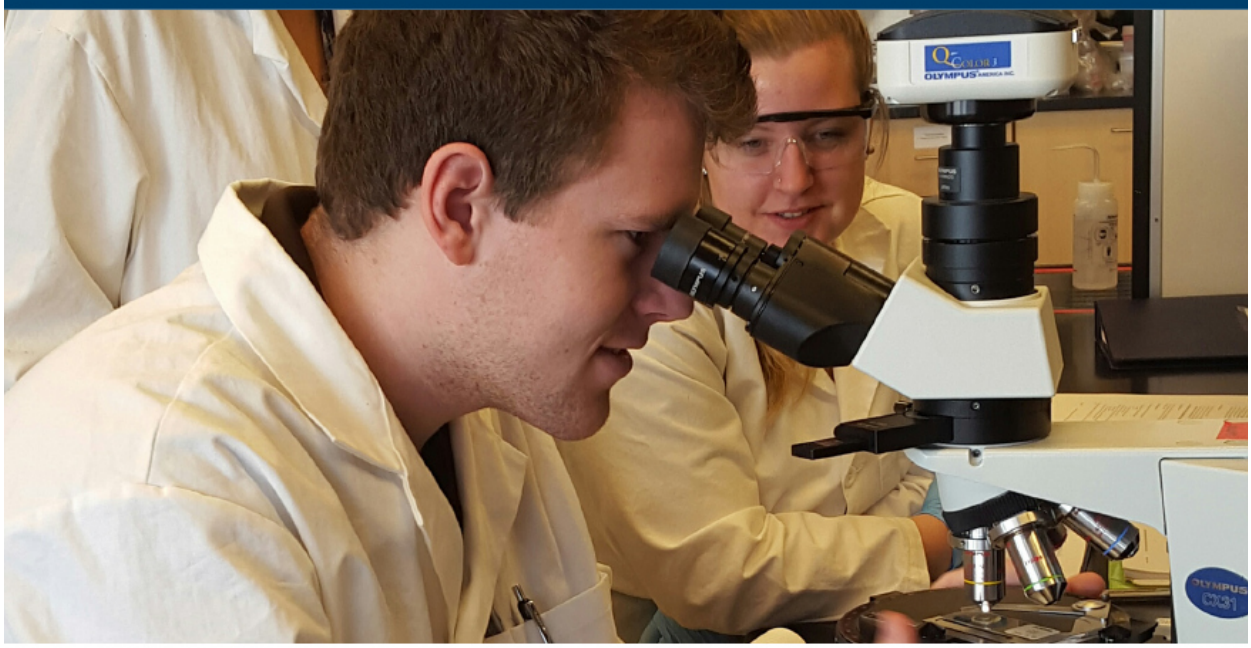
8TH ANNUAL FORENSIC SCIENCE RESEARCH DAY

Friday, April 22

8:15 a.m. to 1 p.m. • Regent Theatre



UNIVERSITY OF ONTARIO INSTITUTE OF TECHNOLOGY

UOIT Forensic Science Research Day 2016

Program Schedule

8:15 a.m.	Registration	Regent Theatre Atrium
	Refreshments	Upper Mezzanine
8:55 a.m.	Welcome	Dr. Greg Crawford, *Dean Faculty of Science*
9:00 a.m.	Keynote Address	Professor Sue Layton
9:15 a.m.	Session I	Chair: Dr. Michael Corbett, *Adjunct Professor*
10:45 a.m.	Break	Upper Mezzanine
11:00 a.m.	Session II	Chair: Mr. David Robertson, *Adjunct Professor*
12:30 p.m.	Closing Remarks	Dr. Hélène LeBlanc, *Associate Professor & Undergraduate Program Director*
12:35 p.m.	Refreshments	Upper Mezzanine

Mission Statement

The Forensic Science program at UOIT strives to create an interdisciplinary learning environment dedicated to education, research, and contribution to the forensic community.

The Forensic Science program endeavours to:

- Advance the highest quality of knowledge, skills and abilities through excellence in teaching and a technologically-enhanced learning environment;
- Foster inquiry, critical thinking and scholarship in innovative research by providing access to state-of-the-art facilities and supervision by internationally recognized faculty and professional experts;
- Actively collaborate with industry to produce outstanding graduates who are consistently sought and highly valued by professional partners and employers;
- Command next-generation leaders demonstrating integrity, ethical behaviour, and professional conduct in the field of forensic science;
- Contribute to society through community participation, leadership and outreach initiatives, with the goal of inspiring youth

Learning Outcomes

A degree is awarded to students who have reliably demonstrated the ability to:

- Apply an in depth knowledge and critical understanding of chemistry, biology, physics, and mathematics to identify, evaluate, analyze and interpret information and hypotheses relevant to forensic science
- Utilize independent learning and analytical skills to solve problems specific to forensic science and broader issues outside the discipline
- Formulate and conduct research or equivalent advanced scholarship in forensic science or a related discipline
- Critically evaluate and describe the principles, concepts, theories and assumptions that form the foundation of forensic science
- Communicate accurately and effectively in written and oral form with members of academia, government and industry, as well as the general public on matters related to the legal applications of science
- Recognize the limitations of the current state of knowledge in forensic science and appreciate the need to adapt to new and emerging technologies in the field
- Pursue further scholarly pursuits, employment, and community involvement to advance the knowledge base in forensic science and contribute towards the economic and societal growth of the community

Forensic Science Program Accreditation

The innovative Forensic Science program at the UOIT has received the prestigious accreditation of the American Academy of Forensic Sciences' Forensic Education Programs Accreditation Commission (FEPAC). It's the second such program in Canada granted this distinction by the Colorado Springs, Colorado-based organization.

Student Capstone Experience

Students in their graduating year may choose to complete either an independent Thesis Research or a Directed Studies project.

The **Thesis Project** provides students with the opportunity, under the supervision of a faculty member or a forensic professional, to integrate and synthesize knowledge gained throughout their program of study. Students must complete a minimum of 280hrs of independent work. The written and oral thesis defense includes a literature review, methods, results and significance of the research.

The **Directed Studies Project** requires independent research of a current topic in a specialized area of forensic science, including, but not restricted to, biology, chemistry, anthropology and the application of science to law. Topics are selected from current research literature and involve a review and critical appraisal of underlying experimental principles. The course comprises independent library research, participation in weekly meetings, as well as written and oral presentations.

Beginning in May 2016, students will have the option of taking a **Mock Crime Scene Practicum** course. Students will investigate a simulated major crime scene synthesizing the knowledge they have gained throughout the forensic science program. They will participate in all aspects of a forensic science investigation, from crime scene to lab, culminating with expert witness testimony in a mock court setting. A mock crime scene scenario will provide an opportunity for students to further develop good judgment, critical thinking and deductive reasoning skills.

Recognition of Supervisors and Mentors

The research conducted by our fourth-year students would not have been possible without the support and mentorship of the following people:

Jim Acquin	Forensic Investigative Services, DRPS
Michael Corbett	Chemical Review Services, Inc.
Lieah Crust	Forensic Investigative Services, DRPS
Sean Bohun	Faculty of Science - Mathematics, UOIT
Franco Gaspari	Faculty of Science - Physics, UOIT
Ismail Gultepe	Environment Canada, Government of Canada
Cecilia Hageman	Faculty of Science – Forensic Science, UOIT
Liam Hendrikse	Consultant Forensic Scientist – Firearms and Ballistics
Nelson Lafrenière	Faculty of Science – Forensic Science, UOIT
Hélène LeBlanc	Faculty of Science – Forensic Science, UOIT
Eleanor McAnsh	Chemistry Section, Centre of Forensic Sciences
Jon Millman	Biology Section, Centre of Forensic Sciences
Kimberly Nugent	Faculty of Science, - Forensic Science, UOIT
Diana Polley	Biology Section, Centre of Forensic Sciences
Barbara Reid	Biology Section, Centre of Forensic Sciences
David Robertson	Faculty of Science – Forensic Science, UOIT
Stacey Sainte-Marie	Faculty of Science – Forensic Science, UOIT

Keynote speaker

Professor Sue Layton

After graduating from the University of Toronto, Sue began her policing career with the Canadian Pacific Railway Police. Her investigative duties were quite varied and she was selected to be trained as a "Scenes of Crime Officer" (S.O.C.O.).

With almost five years of private police experience, Sue entered the world of public service and joined Durham Regional Police. In addition to her regular front-line duties, she acted as a S.O.C.O. for her platoon, working closely with the mentors in the Forensic Identification Unit (F.I.U.).

Sue became a member of the F.I.U. and quickly took on a heavy case load which included lab work, fingerprint comparisons, attending Major Crime scenes, mentoring up to twelve S.O.C.O.s, and testifying in court. She enjoyed the teaching/mentoring aspect of her role and began taking courses in adult education.

After twelve years in the F.I.U., Sue was seconded to Durham College to teach in the School of Justice and Emergency Services. A full-time teaching position became available and she resigned as a detective constable in order to share her training and experience with learners who wish to pursue their own careers in the field of law enforcement.

Sue will retire from Durham College this summer, after a dual career spanning over 29 years. She is delighted to be a part of the 8th Annual Forensic Science Research Day.

Presentations

8:55	**Welcome**: Dr. Greg Crawford
9:00	**Keynote address:** Professor Sue Layton
Chair:	**Dr. Michael Corbett**
9:15	**Philip Chieu**
	Validation of Fluorescence Microspectrophotometry for the Discrimination of Textile Fibres
9:30	**Haillee Thompson**
	The Role of DNA Analysis in Wrongful Convictions
9:35	**Heather Burgess**
	A Comparison of Protocols to Optimize DNA Extraction from Fetal and Adult Skeletal Sus scrofa remains
9:50	**Jasmine Sinitoski**
	Forensic and Legal Significance of DNA in Fingernail Samples
9:55	**Michael Kuczuk**
	Evaluation of the procedure for mRNA profiling utilizing HRM analysis
10:10	**Fathima Usama**
	A Comparative Review of Commonly used Presumptive Blood Tests
10:15	**Shirley Thang**
	The Assessment of the Presence of Saliva in Public Places
10:30	**Refreshment Break, Mezzanine**

Chair: **Mr. David Robertson**

10:50 **Tayler Andonovski**

Investigation of Sample Requirement of Selected Breath Alcohol Test Devices and Instruments

11:05 **Oluwatosin Kuponiyi**

A Summary and Comparison of the Effects of Ketamine on the Development of Insects (Diptera: Calliphoridae)

11:10 **Daniyel Pelletier**

The Investigation of Temperature Data at Different Elevations for Use in Criminal Investigations

11:25 **Allison Campbell**

Fingerprint Dating as Evidence in the Court of Law

11:30 **Mohannad Hassan**

The use of Ultra-Violet and Infra-Red light in the Examination of Forensic Evidence using DSLR Photography

11:45 **Neruson Murugesamoorthy**

A Comparison of Software used for Bloodstain Pattern Analysis

11:50 **Jesse McDonald**

Canine Scavenging and the Effect of Grave Depth

12:05 **Lindsey Weese**

A Literature Review of Fraudulent Passport Examination

12:15 **Closing Remarks:** Hélène LeBlanc

Refreshments and Networking Sessions

Validation of Fluorescence Microspectrophotometry for the Discrimination of Textile Fibres

Philip Chieu; Eleanor McAnsh[1]

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Abstract

This study evaluated fluorescence microspectrophotometry for the analysis of fibres at the Ontario Centre of Forensic Sciences. Forensic fibre analyses can be completed for determining possible contact between individuals and their surroundings. In an effort to preserve fibre evidence, it is necessary to find an analysis method that will help reduce the use of destructive fibre analysis techniques. This research utilized the Craic Technologies QDI 2010 microspectrophotometer system for evaluating the use of fluorescence microspectrophotometry for the examination of fibres. Experiments were designed to test fluorescence of mounting materials; instrument reproducibility, precision, quenching effects and; casework comparisons. Fluorescence of mounting materials was minimal however, some inconsistencies were found. The instrument was able to produce reproducible and precise results with insignificant quenching effects. Casework comparisons displayed fluorescence microspectrophotometry as a viable means to discriminate between forensic fibres. A quality control protocol was developed for the use of fluorescence microspectrophotometry. In addition, limitations of fluorescence microspectrophotometry for casework analyses have been identified.

The Role of DNA Analysis in Wrongful Convictions

Haillee Thompson; Nelson Lafrenière, PhD[1]

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Synopsis

DNA is the blueprint which contains all the genetic information that makes human beings unique. In the field of forensic science, these differences in DNA are exploited to identify individuals in criminal investigations. Since DNA evidence can be found in many forms and in almost all types of crime, DNA analysis has become the leading method of individualization in most criminal investigations. Due to the power of DNA analysis and the continual advancement of the technology, DNA evidence has been used to exonerate people convicted of crimes they did not commit. There are a variety of other factors involved in a criminal investigation that could result in a wrongful conviction, including police tunnel vision, misleading inmate informants and eyewitness misidentification. However, DNA evidence is a double-edged sword - improper implementation of DNA protocols or improper interpretation of DNA profiles can hinder a criminal investigation and even result in wrongful convictions. In both the United States and Canada, non-profit organizations were developed to assist those who have been wrongfully convicted. These organizations, including the Innocence Project, use forensic DNA analysis to exonerate the innocent individuals and in some cases positively identify the actual culprits. These organizations also get involved in working with the justice system to determine the causes of wrongful convictions and establish strategies to prevent wrongful convictions from happening in the future.

A Comparison of Protocols to Optimize DNA Yield from Fetal and Adult Skeletal *Sus scrofa* remains

Heather Burgess; Stacey Sainte-Marie, MSc.[1]; Kimberly Nugent, MSc.[1]

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Abstract

DNA (deoxyribonucleic acid) recovery from skeletonized faunal remains is used to perform taxonomy to aid in forensic wildlife investigations. Taxonomy is important to determine species identification, migration patterns and to create databases. Forensic wildlife investigations examine animal species for illegal wildlife trade, captivity, poaching, animal cruelty and wildlife mortality caused by oil spills.

Little research exists which specifically addresses the extraction of DNA from faunal remains. The goal of my research was to develop and optimize a cleaning, cutting, decalcification and extraction protocol to optimize the DNA obtained from skeletal *Sus scrofa* remains. Samples from the epiphyses and diaphyses of scapulae, ribs and long bones from one adult and three fetal specimens were studied. Bones were sanded using a dremal tool with an aluminum oxide sanding stone, cut using a Keyhole saw, ground to powder and weights were recorded. A sample of bone powder from each sample was decalcified producing a negative result, indicating that calcium was detected in any of the samples. This study demonstrated that a keyhole saw is not ideal for cutting skeletal remains, bone size is not very accurate at determining bone powder mass, and there is no standard for time lengths and methods for decalcifying bone or testing for calcium ions. Future research should experiment with various decalcification protocols and manipulate variables which may effect calcium ions. Additionally, extraction of the DNA using two protocols, phenol-chloroform (PCE) and aggregates of bone crystals (EA) and quantification should be performed to determine if one extraction protocol optimizes DNA yield.

Forensic and Legal Significance of DNA in Fingernail Samples

Jasmine Sinitoski; Nelson Lafrenière, PhD[1]

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Synopsis

DNA has been used in the criminal courts for many years to address the issue of identify through the source of transferred DNA. One location of DNA testing that has proven to be useful in the investigation of sexual or general assaults is that from beneath the fingernails. In these scenarios, the victim may scratch their assailant in order to defend themselves. This causes the assailant's DNA to end up under the victim's fingernails. This DNA evidence can be collected and analyzed for the purpose of determining the individual from which it originated. However, there are many variables including hygiene and daily contact with other individuals which alter the presence of quantifiable DNA that can be collected underneath the hyponychium. This, among other factors, may lead to the misunderstanding and sometimes misinterpretation of DNA evidence and its significance.

Evaluation of the procedure for mRNA profiling utilizing HRM analysis

Michael Kuczuk; Barbara Reid[1]; Diana Polley, MSc.[1]

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Abstract

The ability to distinguish body fluids based upon messenger RNA profiling has been proposed as a valuable alternative to protein-based testing. Proteins are synthesized from mRNA, however proteins can be found in many body fluids and can often times produce false positives and are very discriminatory. By analyzing mRNA, body-fluid specific mRNA markers have been identified for forensically relevant body fluid samples such as semen and spermatozoa. mRNA profiling by High Resolution Melt Analysis utilizes complementary DNA synthesized from mRNA to distinguish body fluids based on melt temperatures. In this research, the specificity of four mRNA markers were explored and the optimization of the mRNA procedure was considered. Semen specific primers semenogelin-1 (SEMG1) and transglutaminase-4 (TGM4) were used, protamine-2 (PRM2) was used as a spermatozoa specific marker, and glyceraldehyde 3-phosphate dehydrogenase (GAPDH) was used as a house keeping gene. The melt temperatures of the amplicons from the mRNA markers for SEMG1, TGM4, PRM2, and GAPDH were determined to be 77.27°C, 82.27°C, 83.39°C, and 77.03°C, respectively. GAPDH was established as a suitable housekeeping gene for continued use in research. These four primers were employed in a double duplex reaction to tentatively identify semen on post-coital samples. The sensitivity of semen detection, using mRNA extracted on EZ1 Advanced XL and analyzed by HRM method, was tested on a series of swabs spiked with dilutions of semen. These were results were compared to the sensitivity of semen detection using differential extraction of DNA (CFS Direct to DNA procedure). This allowed dilutions of neat semen to be made by up to 1/300 for all four mRNA markers. The EZ1 Advanced XL has solidified a role in conducting further validation studies in determining the reliability and robustness of mRNA markers. mRNA profiling utilizing HRM analysis promises a critical role for body fluid identification in sexual assault investigations.

A Comparative Review of Commonly used Presumptive Blood Tests

Fathima Usama; Nelson Lafrenière, PhD[1]

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Synopsis

Blood is the most commonly encountered biological fluid at crime scenes, which makes the identification and analysis of human blood of paramount importance to many crime scene investigations. This directed studies project focused on the comparison of five commonly used presumptive blood tests – the Kastle-Meyer test (KM), Leucomalachite green (LMG), luminol, Bluestar©, and Hemastix®. Factors such as the sensitivity, specificity, ease of preparation and use, and compatibility with subsequent DNA analysis were explored. Based on the collective interpretation of all factors analyzed, Hemastix® was found to be an ideal presumptive blood test for the detection of small, visible stains. Bluestar© was determined to be a good chemiluminescent technique for the detection of latent bloodstains that may have been spread over a large surface. New and emerging techniques used for presumptive blood identification were also explored.

The Assessment of the Presence of Saliva in Public Places

Shirley Thang; Cecilia Hageman, PhD[1]

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Abstract

The purpose of this study was to determine whether saliva was present at various public places. Due to the sensitivity of current forensic DNA technology, it is important for forensic biologists to consider the consequences of background DNA and body fluid indicators in many casework applications. This includes DNA profile mixture analysis, where background DNA may be present in profiles, and in making inferences regarding the transfer and persistence of DNA and cells. The presence of saliva in forensic samples is determined through a finding of the salivary enzyme α-amylase, using the Phadebas® press test, a presumptive test for saliva.

In this study, a total of 828 swabs were previously collected from various locations such as public bathrooms, Toronto subway cars, bus shelters, park benches, airplanes/airports and GO trains. Sixty-eight out of 828 swabs (8.21 %) were positive for the presence of α-amylase in saliva using the Phadebas® press test. More specifically, there were 36 amylase-positive samples from 220 public bathroom samples; 21 positive samples from 370 subway samples; 2 positive samples from 59 bus shelter samples; 4 positive samples from 50 park bench samples; 5 positive samples from 54 airplane/airport samples; and no positive samples from 75 GO train samples.

The results obtained from this study were used to compare to a previous study conducted with the same swabs but tested for the presence of blood by Kastle-Meyer test. In combination of the results, five swabs of the total 828 were positive for the presence of both α-amylase and blood. This result indicates multiple body fluids may be present on forensically relevant locations and illustrate that background body fluids could also be picked up as well when swabbing an area for forensic biology purposes.

Investigation of Sample Requirements of Selected Breath Alcohol Test Devices and Instruments

Tayler Andonovski; Michael Corbett, PhD[1]

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Abstract

Blood alcohol concentration (BAC) may be used as an indicator to law enforcement of a person's level of intoxication. When someone is suspected of operating, or having care or control, of a motor vehicle with excess blood alcohol, a law enforcement officer may demand a breath sample. A variety of alcohol breath test devices and instruments are used to analyze an individual's BAC, which helps to determine if they are over the legal alcohol limit for operating a motorized vehicle or vessel. Some of these devices include the Dräger Alcotest 6810, Intoximeters Alco-Sensor FST, Dräger Alcotest 7410 and CMI Intoxilyzer 8000C instrument. These devices and instrument were examined to independently determine their minimum operating parameters, including pressure, flow rate, volume and time required to obtain a sufficient breath sample, which were then compared to any values cited by the manufacturer. The measuring equipment used to determine the parameters were calibrated using two independent methods. The Alcotest 6810 and Alco-Sensor FST and Alcotest 7410 required minimum flow rates which were lower than the reported values. The Alcotest 6810 and 7410 both required lower minimum volumes than the cited values. The Alcotest 6810 required a longer minimum time to provide a sufficient breath sample than the stated value by the manufacturer. Although the Intoxilyzer 8000C did not have any values reported by the manufacturer, the minimum pressure and flow rate parameters were relatively high at a minimum pressure of 4.90 inches of water and a flow rate of 10.0L/min. For all the devices and instrument, it was found that as the pressure and flow rate increased, the minimum time to provide a sufficient sample decreased. A criminal charge of refusal or failure to comply with a breath demand may be laid on subjects that do not provide a sufficient breath sample. To avoid any unnecessary criminal charge, it is important that these minimum parameters are achieved, otherwise individuals who fail to meet these requirements and are unable to provide a sufficient breath sample for the device or instrument being used, may be inaccurate or found with a reasonable doubt.

A Summary and Comparison of the Effects of Ketamine on the Development of Insects (*Diptera: Calliphoridae*)

Oluwatosin Kuponiyi; Nelson Lafrenière, PhD[1]

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Synopsis

Forensic entomology enables experts to estimate the elapsed time since death, or post-mortem interval (PMI). These estimations are made based on the predictable life-cycle of insects. The presence of drugs or toxins within a body can alter larval development – which in turn can have significant implications for an investigation if the PMI determination is incorrect. The goal of this project was to review the literature and summarize the effects of ketamine on the development of two forensically relevant necrophagous insects – *Chrysomya megacephala* and *Lucilia sericata* (Diptera: Calliphoridae). First, larvae of *C. megacephala* were treated with four different doses of ketamine (0 μg/g, 25 μg/g, 50 μg/g, and 100 μg/g) and exposed to a constant temperature of 32ºC then repeated at 24ºC and 28ºC. Larval lengths, weights, and developmental durations of each stage were observed. Average larval length and weight were significantly less than the control (0 μg/g) at each temperature and all doses of ketamine at 24ºC was the most suppressed for both length and weight. Overall, interaction of ketamine and low temperature can significantly delay the development of *C. megacephala*. The second part of this study used liver (L) and muscle (M) of ten female rabbits were used as subjects – 2 control (L0 and M0) and 8 treated with ketamine (L1 to L4 and M1 to M4). Larvae of *L. sericata* fed on L1/M1, L2/M2, L3/M3 and L4/M4 injected with $0.25LD_{50}$, $0.50LD_{50}$, LD_{50}, and $2LD_{50}$ of ketamine, respectively. Length and weight were measured and analysis of the relationship between the ketamine effect and drug dosage were observed. With the exception of L2 and M2, ketamine concentrations showed a consistent variation as the dosage increased. Significant differences were observed between control and all ketamine treatment for both liver and muscle samples. Regarding the length and for larvae that fed on liver samples, irregular differences were noticed when compared to the control after 60h, the same was also examined for muscle samples. Thus, observations showed that ketamine could progress the growth of *L. sericata* to some extent.

The Investigation of Temperature Data at Different Elevations for Use in Criminal Investigation

Daniyel Pelletier; Ismail Gultepe, PhD[1]; Sean Bohun, PhD[2]; Hélène LeBlanc, PhD[2]

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Abstract

This thesis project aspired to determine if there is a significant temperature variation between the heights of ground level, and an elevated position, relating to the height at which weather stations instrumentation are positioned to take recordings. This investigation is for the intent of forensic entomology use in determining more accurate estimations of the PMI from insect succession calculations when the only temperature data available is from a weather station. The study, conducted late 2015, used temperature sensors placed at approximate ground level, 1 meter elevation, and a 3 meter elevated Environment Canada weather recording station. Statistical F-test and T-test analysis was done for all temperature data. Qualitative graphical analysis was also done to provide explanations for observed temperature patterns or variations. These temperature patterns were also explained with the help of other weather conditions and environmental factors. The complexities of the environment are shown by the lack of consistent relationships between the temperature and elevation from my univariate analysis. No significant differences were found at a 95% confidence level for comparisons of temperature at different elevations. There were, however, some predictable patterns of temperature that were observed from day-to-day. These included temperature increases and an inflective humidity decrease due to solar radiation, morning and evenings having lower ground temperature, and during the day having higher ground temperature. Fetal pigs were placed on the ground to compare to ambient temperature. This research derived a formula that accurately expressed the pig temperature using only recordings of the ambient temperature. The formula can produce very low percent differences if the specific heat capacity constant (γ) is tailored to the specific time of day. This can accurately estimate pig temperatures when calculating PMI using only elevated temperature recordings from a weather station. These PMI estimations should incorporate an error margin that is sufficient to encompass any unpredictable variations in the temperature due to elevation or microenvironment differences. Further multivariate analysis and controlled indoor testing of specific environmental factors is recommended in later studies.

Fingerprint Dating as Evidence in the Court of Law

Allison Campbell; Nelson Lafrenière, PhD[1]

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Synopsis

Fingerprints are one of the most unique pieces of evidence that can be found at a crime scene. With a 1 and 64 billion chance of having two individual fingerprints being identical, a fingerprint is extremely useful for identification. The accumulation of fingerprints in the environment has become of particular interest to forensic investigators and has brought light to a new approach which involves the estimation of a fingerprint's age. Using the compounds excreted from the eccrine and sebaceous glands, and how these compounds diffuse over time, both Time-of Flight Secondary Ion Mass Spectrometry and Gas chromatography-Mass spectrometry have been used in an effort to determine the age of a fingerprint. The results obtained from each analysis were promising, but more experimentation and research will be needed before fingerprint dating will be commonly accepted in a court of law.

There are a variety of analytical factors that will need to be explored, including: (1) the effects of surfaces, temperature, and humidity on the diffusivity of molecules, (2) the time-scale of analysis (days, weeks, months, etc.) and (3) alternate methods of dating. Finally, for it to be used in court, the chosen method of fingerprint dating would need to fulfill the specific criteria for the admissibility of evidence.

The use of Ultra-Violet and Infra-Red light in the Examination of Forensic Evidence using DSLR Photography

Mohannad Hassan; Det. Jim Aquin[1]; Lieah Crust[1]

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Abstract

The analysis of latent fingerprints or bloodstains is generally destructive, and may prevent downstream forensic analyses such as DNA profiling. The invasive nature may be problematic in crime scene analysis. This study aimed to use Ultraviolet (UV) and Infrared (IR) photography in the examination of latent patent and bloodstain patterns. A full spectrum modified digital single-lens reflex camera (Nikon D7100) was used to photograph surfaces containing blood or fingerprints. The surfaces included a variation of porous and non-porous; smooth and rough; and dark to light colored surfaces. The use of UV photography on non-porous, smooth surfaces exhibited the best results for latent fingerprints, while the use of IR photography produced superior results on bloodstained fabrics which are patterned or multicoloured. The results of this study illustrated that the use of UV and IR photography in the analysis of blood and fingerprints is limited. Further exploration of the use of UV and IR photography on the analysis of documents such as cheques may provide satisfactory results based on what was seen when analysing fingerprints on cheques during this study.

A Comparison of Software used for Bloodstain Pattern Analysis

Neruson Murugesamoorthy; Nelson Lafrenière, PhD[1]

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Synopsis

There are a variety of methods used to analyze bloodstains at a scene of a crime. Traditional methods used for bloodstain pattern analysis (BPA) (which include stringing) have enabled experts to determine the origins of bloodstain patterns using simple trigonometry to get a rough estimate of angle of impact. While these traditional methods have been vigorously tested, limitations include the fact that they are quite time and labour intensive. As a result, new digital methods of BPA have emerged – HemoSpat™ and BackTrack™ – which enables analysts off-site to conduct the same BPA as an on-site expert. The performances of these two software programs were compared through a review of the available literature. It was found that HemoSpat™ had superior performance when compared to BackTrack™ in terms of a shorter deviation range (0.17cm to 2.77cm versus 0.46cm to 7.02cm, respectively), additional features (such as rendering in 3D, use of inversion of colours and exporting data) as well as user friendliness, user interface, and accuracy. While a step above traditional methods, these software programs have some major limitations, including the lack of utility for outdoor scenes. In the future, laser scanning may be incorporated to further improve digital BPA.

Canine Scavenging and the Effect of Grave Depth

Jesse McDonald; Nelson Lafrenière, PhD[1]

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Synopsis

The main objective of this study was to review the current knowledge within the field of canine scavenging and to propose an experiment to test a not yet fully documented aspect of canine scavenging: the effect of size and/or depth of a clandestine grave. The question proposed was: does the depth of a grave affect the activity of canine scavengers in outdoor environments? In this experiment multiple deposition sites would be set up, each containing a pig carcass buried at varying depths, and would be monitored using a motion detection camera. It is expected that the depth of a grave will have a significant effect on canine scavengers, and eventually there will be a cut-off point to which the grave is deep enough that canine scavengers will not scavenge it. The results from such an experiment will allow for a better understanding on canine scavenging activity with respect to grave depth, and could even help to estimate how long a body has been buried based on the level of scavenging activity.

A Literature Review of Fraudulent Passport Examination

Lindsey Weese; Nelson Lafrenière, PhD[1]

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Synopsis

A passport is a secure travel document issued by a country's government in order to certify the citizenship and the identity of the document holder. This project looks at the history of forensic document examination, modern forensic document examination, and the history of identity documents and passports. Identity theft and identity fraud are issues that every country faces, and the topic of passport security has become increasingly important. There are a variety of techniques and security features governments can use when creating passports, as well as a number of instruments to analyze suspected fraudulent documents. As the security features have become increasingly sophisticated over the years, the introduction of biometrics and E-passports is starting to be implemented across the world in response to the increasing push for secure "smart" borders. Proponents of biometric solutions suggest that biometrics are almost impossible to forge because our bodies, or rather the information extracted from our bodies, are unique and identifiable. Biometrics are considered natural passwords or identity cards that we carry at all times. The body therefore does not lie.

Congratulations Class of 2016!

Tayler Andonovski

Heather Burgess

Allison Campbell

Philip Chieu

Mohannad Hassan

Shannen Johnston

Michael Kuczuk

Oluwatosin Kuponiyi

Ke Ma

Jesse McDonald

Justin Montes

Neurson Murugesamoorthy

Daniyel Pelletier

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