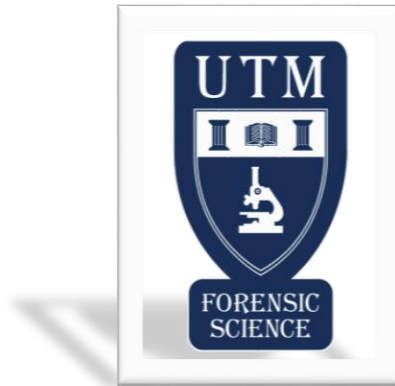# Forensic Science Day Student Internship Presentations



Friday, April 6th, 2018

# The 22nd Annual Forensic Science Day
## Student Internship Presentations

## 8:45 - 9:15 AM

### REGISTRATION AND COFFEE

ROOM KN 108 , KANEFF BLDG/INNOVATION COMPLEX
(RIGHT NEXT DOOR TO THE SECOND CUP COFFEE)

## 9:15 - 9:20 AM

### OPENING WELCOME

MATTHEWS AUDITORIUM, ROOM KN 137
KANEFF BLDG/INNOVATION COMPLEX

### JOEL CAHN, MSC, PHD CANDIDATE
DEPARTMENT OF ANTHROPOLOGY
AND
**LECTURER, FORENSIC SCIENCE PROGRAM**
UNIVERSITY OF TORONTO MISSISSAUGA

## 9:20 - 9:30 AM

### PROFESSOR ULLI KRULL
**VICE-PRESIDENT & PRINCIPAL**
UNIVERSITY OF TORONTO MISSISSAUGA

# The 22nd Annual Fornsic Science Day
# Student Internship Presentations

## 9:30 AM

## STUDENT INTERNSHIP PRESENTATIONS

### MORNING SESSION CHAIR:

### VANESSA ROSSI, MSc CANDIDATE
DEPARTMENT OF ANTHROPOLOGY
UNIVERSITY OF TORONTO MISSISSAUGA

| 9:30 AM | **Claire Swanston**<br><br>*Investigating the Use of Single Metal Vacuum Metal Deposition for Latent Fingerprint Visualization* | PAGE<br><br>12 |
|---|---|---|
| 9:40 AM | **Aaron Yu**<br><br>*Testing the Optimal Metal for Latent Fingerprint Development on Low Density Polyethylene Plastics Using the Vacuum Metal Deposition Technique* | 13 |
| 9:50 AM | **Yee Tung (Charmaine) Fung**<br><br>*Assessing the Suitability of Sciluminate for Fingerprint Recovery from Surfaces of Differing Colours and Porosities* | 14 |
| 10:00 AM | **Qadija Yusuf**<br><br>*Using HFE 7100 as a Carrier for Rhodamine 6g in Fingerprint Detection* | 15 |

# The 22nd Annual Forensic Science Day
## Student Internship Presentations

| | | |
|---|---|---|
| 10:10 AM | **Michael Ho**<br><br>*The Use of Liquid Latex for Fingerprint Recovery on the Exterior Surface of Vehicles* | PAGE<br><br>16 |
| 10:20 AM | **Namrata Kochhar**<br><br>*Using 3D Fingerprinting to Unlock an iPhone* | 17 |
| 10:30 AM | **Quan Le**<br><br>*The Feasibility of Using a Blood Substitute in Bloodstain Pattern Analysis* | 18 |

### 10:40 – 11:05 AM
### COFFEE BREAK
ROOM KN 108 , KANEFF BLDG/INNOVATION COMPLEX

| | | |
|---|---|---|
| 11:05 AM | **Breanne Reidy**<br><br>*Rates of Decomposition and Taphonomic Changes in Lake Simcoe* | 20 |
| 11:15 AM | **Andres Rodriguez Betancourt**<br><br>*Virtual Reassembly of Fragmentary Crania: An Assessment of Accuracy and Reliability for Osteological Analyses* | 21 |

# The 22nd Annual Forensic Science Day
## Student Internship Presentations

| | | |
|---|---|---|
| 11:25 AM | **Grace Gregory-Alcock**<br><br>*Prevalence of Marijuana and Alcohol in Fatal Motor Vehicle Collisions in Nova Scotia* | PAGE<br><br>22 |
| 11:35 AM | **Navneet Aujla**<br><br>*Homicide and Indigenous Canadians in Ontario; a 10 Year Retrospective Study (2005-2015)* | 23 |
| 11:45 AM | **Louise Lee**<br><br>*The Relationship Between Body Mass Index and Characteristics of Sharp Force Injury Deaths* | 24 |
| 11:55 AM | **Long Hin Leung**<br><br>*Optimizing Running Conditions for Digital Droplet PCR of Bacterial Gene* | 25 |
| 12:05 PM | **Grace Gao**<br><br>*Feasibility of Dissolvable Swabs for DNA Recovery* | 26 |
| **12:15 - 1:50 PM**<br>**LUNCH BREAK**<br>THE BLIND DUCK PUB | | |

# The 22nd Annual Forensic Science Day
## Student Internship Presentations

### 1:50 -2:10 PM

#### KEYNOTE SPEAKER
#### CAITLIN PAKOSH, HBSc, JD

*R&R in the Criminal Justice System:*
*Scientific Research, Evidentiary Reliability*

### 2:10 PM

#### STUDENT INTERNSHIP PRESENTATIONS

##### AFTERNOON SESSION CHAIR:
##### VANESSA ROSSI, MSC CANDIDATE
DEPARTMENT OF ANTHROPOLOGY
UNIVERSITY OF TORONTO MISSISSAUGA

| Time | Presentation | PAGE |
|---|---|---|
| 2:10 PM | **Joy Chen** <br> *Detecting Signature Characteristics Attributable to the Autopen Atlantic II* | 30 |
| 2:20 PM | **Cathy Zhao** <br> *Are Psychopaths Morally Incapacitated? A Review of the Affective Evidence* | 31 |
| 2:30 PM | **Elizabeth Steele** <br> *Influence of Communicator Characteristics on Opinions of Guilt* | 32 |
| 2:40 PM | **Sabrina Demelo** <br> *Determining the Effect of the Prolific Offender Program on Crime Severity for Monitored Prolific Offenders in the Waterloo Region* | 33 |

# The 22nd Annual Forensic Science Day
## Student Internship Presentations

| | | PAGE |
|---|---|---|
| 2:50 PM | **Hafsa Saleem**<br><br>*The Association Between Urine Drug Testing (UDTs) and Substance Use Deterrence in Forensic Psychiatric Patients* | 34 |
| 3:00 PM | **Kahina Haroune**<br><br>*A 10-year Retrospective Study of Miscarriage of Justice Arguments in the Ontario Court of Appeal* | 35 |

# 3:10 PM

### CLOSING REMARKS

### JOEL CAHN
**FSC481Y COURSE INSTRUCTOR**
**FORENSIC SCIENCE PROGRAM**
UNIVERSITY OF TORONTO MISSISSAUGA

**FSC Class of 2018
Student Intern Group Photo**

## *Reception Immediately Following at*

## *The Blind Duck*

### *Until 5:00 PM*
*(Cash Bar)*

# FORENSIC SCIENCE

## AT THE

## UNIVERSITY OF TORONTO MISSISSAUGA

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*Each year we attract some of the brightest students from across Canada and worldwide to take part in this unique program. The program admits about 130 students per year out of the hundreds who apply. Students transfer to this campus from all across the country. Over the last few years, we have had many students from British Columbia, Alberta, Saskatchewan, Quebec, Nova Scotia, and Newfoundland. From within Ontario, we have students from as far away as Thunder Bay, Windsor, and Ottawa. Students obtain an Honours BSc Degree in Forensic Science by choosing to complete one of our four Specialist Programs: Forensic Anthropology, Forensic Biology, Forensic Chemistry or Forensic Psychology or, students can choose to complete a Forensic Science Major in conjunction with a second major from one of the following disciplines: Anthropology, Biology, Chemistry, or Psychology. In addition to the above programs, we have also just recently introduced a new Minor Program in Forensic Science. The Minor Program can be taken in combination with any specialist or major program, including those from the Social Sciences and Humanities. This Minor program complements degrees in criminology, sociology, geography, political science, and any other field that intersects with the legal system. Students will learn forensic theory and at least one applied skill set through lectures and labs. Today we are celebrating the success of our Specialist degree students.*

# INTERNSHIP IN FORENSIC SCIENCE AND THE IMPORTANCE OF MENTORS

*FSC 481 is the fourth year internship course required for all graduates of the Forensic Science Specialist Program at the University of Toronto Mississauga. In addition to spending at least 200 hours at a forensic agency participating in on-the-job training or job shadowing; assisting with routine tasks; and collaborating with a professional forensic specialist on an original research project; students also attend classes on professional practice and research skills. Experiential learning combined with a first class science degree is the keystone of the UTM Forensic Science Program. Successful internships benefit the student, the mentor, and the agency through an exchange of ideas, learning opportunities, and resources dedicated to addressing a research problem or question of interest to the forensic agency and its employees. Forensic Science Day is the culmination of these partnerships.*

*In addition to class assignments designed to develop professional skills (a mock job interview, writing a cover letter and resume, practice presentations, critical assessment of colleague's research, and a mock trial), students also learn research skills such as obtaining ethics permission for research and writing a detailed research proposal. The research results are submitted in the form of a manuscript suitable for publication, written to the specifications of the Journal of Forensic Sciences. After final grading and editing by the course instructor, we anticipate that, with the mentors' approval (and given co-authorship), at least half of the research projects presented today will be accepted for publication in a peer-reviewed journal. We also ask that all students provide a PDF of their corrected paper to the FSC program to keep on file for future reference so that their data and conclusions can be made available to others in the forensic sciences.*

*It is our pleasure today to thank the mentors and to praise the initiative and efforts of these very bright students.*

# OPENING WELCOME

## 9:15 - 9:20 AM

### JOEL CAHN

**MSc, PhD Candidate**
**Department of Anthropology**

**FSC481Y Course Instructor**

**FORENSIC SCIENCE PROGRAM**
**University of Toronto Mississauga**

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## 9:20 - 9:30 AM

### PROFESSOR ULLI KRULL

**Interim Vice-President & Principal**
**University of Toronto Mississauga**

# 9:30 AM

# MORNING SESSION

# PRESENTATIONS

## SESSION CHAIR:

## VANESSA ROSSI, MSc CANDIDATE
Department of Anthropology
University of Toronto

Teaching Assistant
FSC481Y5 Internship in Forensic Science

# Claire Swanston

## *Investigating the Use of Single Metal Vacuum Metal Deposition (VMD) for Latent Fingerprint Visualisation*

**ABSTRACT**

Vacuum metal deposition (VMD) is a sensitive fingerprint development technique that can be used on a wide variety of nonporous substrates. The purpose of this research was to determine if single metal VMD can develop latent fingerprints of a higher quality than the standard combination of gold and zinc. This study tested four different single metals (silver, sterling silver, tin, and copper) in comparison to gold and zinc. Fingerprints were deposited on five common substrates including plastic code 1, plastic code 6, tinfoil, glass, and DVD's. Each metal was tested with increasing amounts of metal wire on fingerprints of differing ages, ranging from two days to five weeks. Each developed fingerprint was given a quality score based on the UK Home Office Grading System by a trained fingerprint examiner. Scores were converted to a binary system of success or failure. Chi-squared tests revealed that silver and sterling silver developed significantly more identifiable fingerprints than gold and zinc on four out of the five substrates. Sterling silver performed significantly better compared to silver on three out of the five substrates. The number of successful developments increased with the amount of metal wire used. Time was a significant factor affecting development only on fingerprints deposited after two days. This research suggests that sterling silver is the best single metal replacement for gold and zinc when using VMD to develop latent fingerprints. It is recommended that facilities using VMD change their policies and adopt sterling silver in place of the current gold-zinc standard.

**Keywords:** forensic science, forensic identification, vacuum metal deposition, fingerprints

**Supervisors:** Noel Christiansen M.E., RCMP Surrey Forensic Identification Division

# Aaron Yu

## *Testing the Optimal Metal for Latent Fingerprint Development on Low Density Polyethylene Plastics Using the Vacuum Metal Deposition Technique*

**ABSTRACT**

Using the vacuum metal deposition (VMD) technique, latent fingerprints can be developed by depositing metal onto the fingerprint. Gold/zinc was the standard metal used by the RCMP however there were difficulties producing consistent quality prints. The purpose of this study was to determine the optimal metal to use for VMD fingerprint development on low density polyethylene (LDPE) plastics. Ten different LDPE plastics were chosen for testing based on their frequent recovery from crime scenes. All substrates were developed with 6 different metals over 6 different time periods, ranging from 2 days to 5 weeks after deposition. The fingerprints (n=1440) were examined and scored based on their quality after development using the UK Home Office Grading System. The chi-square test was implemented to determine if the number of identifiable fingerprints varied significantly between the different metals used for development. The results showed that silver developed significantly more identifiable prints than the gold/zinc standard for 8 out of 10 substrates. Sterling silver also showed promising results, outperforming gold/zinc for 6 out of 10 substrates. Copper, aluminum/zinc, and tin did not produce a significant amount of identifiable prints. Therefore, silver is the optimal metal to use for VMD as it produces better quality fingerprints on the vast majority of LDPE plastics, and is more cost-effective compared to the gold/zinc standard.

**Keywords:** forensic science, forensic identification, vacuum metal deposition (VMD), LDPE plastics, fingerprint detection, gold/zinc deposition, silver deposition

**Supervisor:** Noel Christiansen M.E., RCMP Surrey Forensic Identification Division

# Yee Tung (Charmaine) Fung

## *Assessing the Suitability of SciLuminate for Fingerprint Recovery from Surfaces of Differing Colours and Porosities*

### ABSTRACT

The use of traditional powders to develop latent fingerprints is dependent on the colour contrast provided by the background of a surface and its porosity. SciLuminate is a new fingerprint powder claimed to provide optimal enhancement regardless of the colour and the porosity of a surface. The purpose of this experimental study was to examine the suitability of SciLuminate for developing latent fingerprints in comparison to traditional fingerprint powders. The independent variables analyzed in this study were porosity, colour, and age of fingerprints. The traditional powders used were black, white, and green fluorescent powders to maximize contrast on a variety of backgrounds. A total of (n=324) fingerprints were deposited by one donor using a reference pad onto surfaces of varying porosities and coloured backgrounds commonly encountered at crime scenes (glass bottles, aluminum cans, magazine paper, polymer banknotes, paper bags, and photocopy paper). The fingerprints recovered by SciLuminate and traditional powders were then graded with the Bandey Scale. Statistical analyses showed that traditional powders out-preformed SciLuminate in the following categories: semi-porous surfaces, porous surfaces, light-coloured surfaces, and recently deposited fingerprints (0-2 days old). In all other categories, SciLuminate and traditional powders did not significantly differ in performance. Traditional powders were 9, 12, and 4 times more likely to succeed on semi-porous, porous, and light-coloured surfaces respectively. Traditional powders were also at least 5 times more likely to succeed on recent fingerprints between zero and two days old. Therefore, SciLuminate should not be adopted as an alternative to traditional fingerprint powders.

**Supervisors**: Det. Sgt. Brad Joice and Det. Cst. Curtis Williamson, York Regional Police Forensic Identification Unit

# Qadija Yusuf

## *Using HFE 7100 as a Carrier for Rhodamine 6G in Fingerprint Detection*

**ABSTRACT**

Rhodamine 6G is a fluorescent spray used to enhance latent fingerprints after development in a cyanoacrylate chamber. The purpose of this research was to develop a modified rhodamine 6G spray using HFE 7100 as a carrier in order to improve the current enhancement process for cyanoacrylate-developed latent fingerprints. Incorporating HFE 7100 as a carrier to create a modified spray has the potential to improve processing efficiency and user safety by increasing the drying time and providing a non-toxic and non-flammable alternative to methanol. A preliminary test (n=24) was conducted to determine the utility and optimal recipe for the modified spray by comparing the performance of the standard Rhodamine 6G spray with 5 alternative sprays. The alternative sprays contained the same concentration of Rhodamine 6G and HFE 7100 but consisted of varying amounts of isopropanol and acetone stabilizers. The results from the preliminary test indicate that all modified sprays significantly reduced drying time compared to the standard spray, with the most optimal modified spray being spray 3. A quality assurance test (n=120) was then conducted using spray 3 on 4 types of non-porous surfaces (plastic bags, plastic bottles, metal cans, glass bottles) to assess whether the quality of fingerprints could be maintained. A chi square analysis revealed that there was no association between spray composition and fingerprint quality indicating that the quality of fingerprints was maintained when using the modified spray. Using HFE 7100 as a carrier for Rhodamine 6G significantly improves the efficiency of enhancing latent fingerprints without sacrificing quality.

# Michael Ho

## *The use of Liquid Latex for Fingerprint Recovery on the Exterior Surface of Vehicles*

### ABSTRACT

This study tested the feasibility of recovering latent fingerprints from the exterior surface of vehicles after using liquid latex. Sixty fingerprints were deposited onto three vehicles that were driven for varying time intervals consisting of two weeks, three weeks, and four weeks. The deposition and recovery of latent fingerprints was repeated for each vehicle three times to ensure the consistency of results, generating a total of 540 fingerprints. The left side of the vehicle was recovered using liquid latex and black fingerprint powder (n=270), whereas the right side of the vehicle was used as a control and only recovered with fingerprint powder. The liquid latex method successfully recovered 177 out of 270 fingerprints (65.5%), while the control method recovered 36 out of 270 fingerprints (13.3%). Chi-square tests revealed that the use of liquid latex and the time since deposition significantly affected the number of identifiable fingerprints recovered ($p<0.05$). An odds ratio test demonstrated that the use of liquid latex increases the odds of fingerprint recovery by 12.3 times. The results indicate that liquid latex is a feasible method improving fingerprint recovery on the exterior surface of vehicles by safely removing excess dirt and debris. It is recommended that police agencies incorporate the use of liquid latex in casework when processing the exterior of vehicles.

**Keywords:** forensic science, fingerprint recovery, liquid latex, vehicles

**Supervisors:** D/C Mathew George and D/Sgt. Brad Joice, York Regional Police Forensic Identification Unit

# Namrata Kochhar

## *Using 3D Fingerprinting to Unlock an iPhone*

### ABSTRACT

Pertinent documents, images, and conversations are often stored on the phones of victims and suspects, which when lawfully obtained can assist in directing police investigations. Using current 2D techniques, specialists face challenges when attempting to unlock iPhones. The purpose of this study was to create a 3D fingerprint model from a 2D ink-rolled fingerprint to successfully unlock an iPhone. The scope of the study was broadened to include the Samsung Galaxy S8 in order to assess the suitability of this technique for other phone brands. Three 3D casting methods were tested in this study: a direct method (using a 3D printed positive cast), an indirect method (using 3D printed negative molds) and a manual method (using non-printed molds and casts). The results show that the direct and indirect 3D casts were not recognized by the phone's sensor. As for the manual method, the Elmer's glue was the only material that produced a viable cast that successfully unlocked the phones. Given its thinner composition and ability to hold the fingerprint impression, the glue is believed to allow conductivity through the user's skin and onto the sensor. This study advances current knowledge regarding the potential applications of 3D fingerprinting within the field of forensic identification.

**Keywords:** forensic science, forensic identification, 3D technology, fingerprinting, iPhones, biometrics

**Supervisors:** Michelle Pflug, Michael Taylor, Robert Hofstetter, and Clayton Asano; Peel Regional Police Forensic Identification Services Unit

# Quan Le

## *The Feasibility of Using a Blood Substitute in Bloodstain Pattern Analysis*

### ABSTRACT

This experimental study tested the feasibility of using a silicon-based blood substitute for use in BPA training and research using FARO 3D laser scanning technology. Impact bloodstain patterns composed of the blood substitute and sheep's blood were repeatedly created at separate instances using a custom-built impact rig. The custom rig was set-up at various distances of 50cm, 75cm, and 100cm from two orthogonal walls (each distance set n=5, total n=30). The bloodstain patterns were recorded using a FARO Focus$^{3D}$ laser scanner and Canon PowerShot S100 camera. The resulting scans and photos were imported and processed in FARO Scene software with the Forensic Plugin. The area of origin was represented in the Cartesian coordinate system: x=distance to left wall, y=distance to right wall, and z=distance to ceiling. Mean differences between the true area of origin and the area of origin determined from recreations using the blood substitute were statistically greater than the mean differences created with sheep's blood at all distances ($p < 0.05$). The 50cm distance trial was the only result created by the blood substitute that fell within the accepted range of error reported in literature. The results of this study indicate that the blood substitute is not a suitable proxy for real blood when calculating the area of origin from impact patterns, even though it is more cost-effective and eliminates many ethical concerns. Therefore, it is not recommended that this blood substitute be used for teaching and research in BPA at this point in time.

**Keywords:** forensic science, bloodstain pattern analysis, blood substitute, FARO Focus laser scanner, FARO Scene, area of origin, impact pattern

**Supervisor(s):** Eugene Liscio, AI2-3D

10:40 - 11:05 AM

MORNING SESSION

COFFEE BREAK

*ROOM K108, KANEFF BLDG/INNOVATION COMPLEX*

*(NEXT TO THE SECOND CUP)*

# Breanne Reidy

## *Rates of Decomposition and Taphonomic Changes in Lake Simcoe*

### ABSTRACT

This pilot project examined the rates at which pig remains decomposed in Lake Simcoe, accounting for taphonomic changes such as animal predation and environmental factors. This project followed the research structure laid out by Dr. Anderson and Dr. Bell from Simon Fraser University, who assessed the decomposition of pig remains in the Saanich Inlet of British Columbia. A single female pig, weighing 110lb, was placed in a large breed dog cage (48L x 30W x 33H") at a depth of 20 feet in Cook's Bay off the shore of East Bourne in Lake Simcoe. Weekly photographs and videos were taken using a remotely operated vehicle (ROV). The pig was observed for decompositional and additional taphonomic changes over a period of 4 weeks after placement into the lake. Each week, observations of weather and water temperature, soft tissue discolouration and slippage, and animal predation were recorded. To date, there have been slight changes in the skin colouration of the pig remains concentrated in the head and torso regions. A halo of mold appeared and surrounded areas of the head, neck, torso and limbs. There was no animal predation visible likely due to low water temperatures and the size of the cage which limited larger scavengers. This pilot project is part of a long-term study that will provide the York Regional Police with information regarding the decomposition process expected in Lake Simcoe for use in ongoing and future missing person's or lake death investigations in this area.

**Keywords**: forensic science, forensic anthropology, decomposition, taphonomic changes, Lake Simcoe

**Supervisor**: PC Doug Penner, York Regional Police Marine Unit

# Andrés Rodríguez Betancourt

## *Virtual Reassembly of Fragmentary Crania: An Assessment of Accuracy and Reliability for Osteological Analyses*

### ABSTRACT

Working with fragmentary skeletal remains is a challenging task for Forensic Anthropologists, as certain osteological analyses can only be preformed accurately when the specimens available for examination are complete. Recently, forensic anthropologists have begun to explore the viability of adopting a technological approach by using computer graphics software to reassemble and reconstruct fragmentary remains. The accuracy of these reconstructions require validation for implementation in court.

The purpose of this study was to determine whether digitally reassembled crania are reliable reconstructions of their original counterparts for use in osteological analyses. Three domestic pig crania were selected and digitized using a desktop laser scanner. The crania were then fragmented and scanned to produce 3D models of the fragments which were virtually reassembled using computer graphics software. The fragments were also physically reassembled using the traditional mechanical fitting technique. 3D models of the virtually reassembled specimens and the physically reassembled specimens were compared to 3D models of their corresponding unfragmented counterparts using the CloudCompare software, where a deviation analysis was performed. The resulting means and RMS of the cloud to mesh distances show that for each cranium, the virtually reassembled models more closely resembled the unfragmented crania compared to the physically reassembled specimens.

A digital approach to the reassembly of fragmentary remains would allow Forensic Anthropologists to perform fine adjustments that are not possible using the traditional physical methods. The digitization of skeletal remains also creates a permanent record of specimens and allows for world-wide data sharing with other professionals and institutions.

**Keywords:** forensic anthropology, fragmentary remains, digital reassembly, laser scanning, pig crania, 3-D technology

**Supervisor:** Eugene Liscio, P. Eng.

# Grace Gregory-Alcock

## *Prevalence of Marijuana and Alcohol in Fatal Motor Vehicle Collisions in Nova Scotia*

**ABSTRACT**

This research examined the prevalence and concentrations of delta-9-tetrahydrocannibinol (THC) alone and in combination with alcohol in victims of fatal motor vehicle collisions (FMVCs) in Nova Scotia. Unlike alcohol which has an established legal limit of 0.08 mg/mL, there has yet to be a consensus on the concentration of THC where impairment begins. The Government of Canada has tentatively set the legal limit of THC for a summary conviction at 2.5-5ng/mL. This study employed the analysis of secondary data collected from the Nova Scotia Medical Examiner Service's database. Data was collected from individuals who were drivers and died at the scene of a FMVC between January 1st, 2009 and December 31st, 2016 (n=214). The majority of individuals with THC, had concentrations from approximately 1 ng/mL to 17 ng/mL. A chi-squared analysis showed that there was no statistically significant difference between the sexes. However, as only four females in the study were found to have THC, they were not included in subsequent chi-square analyses examining the association of THC and/or alcohol with age. Chi-squared analyses of males only indicated that the use of THC alone or in combination with alcohol is significantly related to age. The results of this research provide an understanding of the demographics of individuals consuming marijuana and demonstrates support for a legal limit of 2.5 ng/mL.

**Keywords**: forensic science, forensic pathology, toxicology, alcohol, marijuana, fatal motor vehicle collisions, concentration, legal limit

**Supervisors**: Dr. Matthew Bowes and Eveline Gallant RN, Nova Scotia Medical Examiner Service

# Navneet Aujla

## Homicide and Indigenous Canadians in Ontario: a 10-Year Retrospective Study (2005-2015)

### ABSTRACT

This study examined whether Indigenous Canadians were over-represented as victims of homicide in Ontario and identified vulnerable groups within the population on the basis of age, sex, and geographic location. Data on the Indigenous status, age, sex, and geographic location of all homicide victims in Ontario from 2005 to 2015 was collected from the Coroner's Information System (n=2091). Homicides that occurred outside of the province or those where only skeletal remains were found were excluded from data collection. Information regarding population estimates were collected from Census Canada for the years 2006, 2011, and 2016, and averaged to have an overall estimate of the Indigenous and Non-Indigenous Canadian populations in Ontario from 2005 to 2015. It was found that Indigenous Canadians were significantly over-represented as victims of homicide in Ontario as well as within a number of census divisions such as Kenora and Thunder Bay Districts. In all age groups except 0-14 and 20-24 years of age, Indigenous Canadians were significantly over-represented as victims of homicide. Indigenous Canadian males were also over-represented as victims of homicide in Ontario, however there was no significant difference found between Indigenous and Non-Indigenous Canadian females as homicide victims. The results of this study can be used as the basis of new policies that would aim to protect the vulnerable groups identified, and to minimize the significant over-representation of Indigenous Canadians as victims of homicide.

Keywords: forensic science, forensic pathology, Indigenous Canadians, homicides, Ontario

Supervisors: Dr. Kona Williams, Ontario Forensic Pathology Service

# Louise Lee

## *The Relationship between Body Mass Index and Characteristics of Sharp Force Injury Deaths*

### ABSTRACT

This retrospective study examined the relationship between Body Mass Index (BMI) and sharp force trauma. Previous research has suggested that overweight individuals experience both a protective and detrimental effect caused by excess adipose tissues and associated medical comorbidites in instances of trauma. Research on the risk of death associated with drug-related behaviours, has demonstrated that drug-users were frequently underweight. The association between wound severity and risk of death with weight resulting from sharp force injuries is currently unknown. This information has the potential to assist death investigators in illuminating circumstances surrounding and contributing to death. Autopsy files from the Hamilton Regional Forensic Pathology Unit for all sharp force related deaths examined in 2007 to 2018 (n=852) were reviewed to analyze BMI, the severity of wounds, depth of penetration, the location of injuries, organ injured, comorbidity, toxicology, place of death, and manner of death. Logistic regression revealed that BMI was a significant predictor for the location of injuries ($p=0.004$) and comorbidities ($p=0.049$), but not for the severity of injuries ($p=0.053$), depth of penetration ($p=0.682$) and organ injured ($p=0.193$). Results also showed that BMI was not a significant predictor for the place of death ($p=.0139$), the manner of death ($p=0.272$), and the presence of drugs ($p=0.258$). These results advance the understanding of the effects of BMI on sharp force injury patterns and drug- related behaviours. The trends found in this study can assist death investigators by providing insight into cases where injuries may have been complicated by BMI.

# Long Hin Leung

## *Optimizing Running Conditions for Digital Droplet PCR of Bacterial Gene*

### ABSTRACT

The purpose of this study was to optimize the running conditions of digital droplet PCR (ddPCR) in terms of the annealing temperature, duration and number of cycles for eight PCR assays of bacterial plasmids inserted with different target genes. Optimization was assessed by examining the separation between the positive and negative PCR droplets. The first ddPCR run was performed starting with the standard conditions utilized in qPCR assays and the results were recorded. The conditions for subsequent runs were modified, altering the annealing temperature, increasing annealing duration (in 15 second intervals), and/or increasing the number of annealing cycles (in increments of 5). A one-way ANOVA was performed to compare the mean separation between each condition which showed a significant difference in at least one of the ddPCR conditions. Post-hoc tests identified the condition yielding the largest separation between droplets for each target gene. The optimal conditions were determined for all 8 assays to be: adenovirus (57°C, 45x cycle, 1 min 15 s duration), C. andersoni (57°C, 45x cycle, 1 min duration), Cryptospp3 (56°C, 45x cycle, 1 min duration), EFIA (59°C, 40x cycle, 1 min duration), HSP (58°C, 45x cycle, 1 min duration), P-PSB (55°C, 45x cycle, 1 min 15 s duration), P-PSH (57°C, 45x cycle, 1 min duration) and HNV HRV (56°C, 45x cycle, 1 min 15 s duration). This research establishes standards for the running conditions of ddPCR for the targets. These established optimal conditions of ddPCR will improve the detection and quantification of microorganisms present in water, a key component in ensuring water safety.

# Grace Gao

## *Feasibility of Dissolvable Swabs for DNA Recovery*

**ABSTRACT**

Cotton swabs are regularly used in forensic laboratories and by crime scene investigators to collect biological evidence. A reported drawback to this evidence collection technique is that a portion of the biological material can be retained on the cotton swab and is not released during DNA analysis. The purpose of this study was to test a new type of dissolvable swab, made by the manufacturer Luna, which could potentially yield a higher quantity and quality of DNA from biological samples compared to cotton swabs. This is particularly useful in cases where the amount of DNA extracted is insufficient to perform analysis and generate a complete profile. Three different biological fluids (semen, blood and saliva) of low (5-10pg/uL) and medium (100-200pg/uL) concentrations were tested with dissolvable swabs (n=36) in both the conventional CFS and G2-MTL buffer. The same testing conditions were replicated and conducted using the cotton swabs (n=18) in the CFS buffer. The results indicated that no significant differences exist in the quantity of DNA generated between the two types of swabs for all samples. The only exception was blood samples of medium concentration. The two types of swabs also generated similar DNA profiles that were full and concordant.  The results of this study demonstrate that cotton and dissolvable swabs produce comparable results in terms of the quantity and quality of DNA generated from blood, semen and saliva. This eliminates the need to alter current crime scene and CFS protocols for the collection of biological samples.

**Keywords**: forensic science, forensic biology, cotton swabs, dissolvable swabs, DNA analysis

**Supervisors:** Dr. Jonathan Millman and Loretta D'Costa, Centre of Forensic Sciences Biology Section

# 12:15 PM

## LUNCH

## THE BLIND DUCK
### Student Centre

# 1:50 -2:10 PM

# KEYNOTE SPEAKER



## CAITLIN PAKOSH, HBSC, JD

*R&R IN THE CRIMINAL JUSTICE SYSTEM:
SCIENTIFIC RESEARCH, EVIDENTIARY RELIABILITY*

# 2:10 PM

## AFTERNOON SESSION

## PRESENTATIONS

### SESSION CHAIR:

**VANESSA ROSSI, MSc CANDIDATE**
Department of Anthropology
University of Toronto

Teaching Assistant
FSC481Y5  Internship in Forensic Science

# Joy Chen

## *Detecting Signature Characteristics Attributable to the Autopen Atlantic II*

### ABSTRACT

The Autopen Atlantic II is a signature signing machine. The purpose of this study was to determine if the Autopen Atlantic II could create an automated signature that is indistinguishable from a genuine handwritten signature by examining signature characteristics. There is limited published data and reference comparisons available regarding Autopens in relation to forensic document analysis. Increased public awareness of automated signature technology requires that forensic document examiners (FDEs) be aware of the features associated with autopen signatures, especially since Autopens may be used to execute forged signatures. Sample signatures (n=135) of three styles – type-based, mixed, and stylized – produced by the Autopen at variable speed and pressure settings were examined and compared to genuine handwritten signatures. The signatures were evaluated for instances of tapered or blunt ends, pen lifts, letter construction errors, and tremor. In this study, autopen signatures differed from the genuine signatures by the presence of blunt ends, construction errors, and some tremor. The mixed signature (#3) resulted in the most deviations from the genuine signature, and the stylized (#2) resulted in the least. This result can be attributed to the number of strokes required to construct these signatures. All the signatures, regardless of style or complexity, exhibited characteristics that would distinguish them from genuine signatures. The identified characteristics of autopen signatures presented in this research will allow FDEs to make conclusions regarding the authenticity of a signature with greater certainty and confidence.

# Cathy Zhao

## Are Psychopaths Morally Incapacitated? A Review of the Affective Evidence

**ABSTRACT**

Recent moral psychological studies of diagnosed psychopaths have neither validated nor falsified the hypothesis that psychopaths have substantial deficiencies in terms of their moral comprehension and judgment. One possible explanation for these discrepant findings is that researchers have not distinguished between theories that posit reason versus emotion as the driving mechanism behind moral comprehension within their test paradigms. The purpose of the current review is to investigate research focusing exclusively on moral-emotional differences in psychopaths, and in turn explore whether this paradigm yields a different conclusion regarding psychopaths' moral psychological capacities. Examining affective rather than cognitive differences in moral comprehension was expected to reveal more substantial differences between psychopaths and controls. Studies of response to moral stimuli (n=32) using either: skin conductance, heart rate, startle reflex or fMRI were included. As predicted, psychopaths (95%)had significantly different affective activation compared to controls showing overall hypo-activity in skin conductance, heart rate, startle reflex, and neurological activation across multiple brain regions. The most consistent region of the brain exhibiting an increase in neurological activation was the limbic system (amygdala). The current study also revealed that psychopaths (35%) were not distinguishable from controls in behavioural tests. Overall, these findings provide support for the theory that psychopaths have abnormal moral comprehension. This study suggests that future research in psychopathy may benefit from a shift towards emotional mechanisms and affective traits when analyzing psychopaths alleged moral psychological incapacities. This research also offers insights for developing assessments tools for risk and rehabilitation.

# Elizabeth Steele

## Influence of Communicator Characteristics on Opinions of Guilt

### Abstract

Characteristics of a communicator can influence how listeners perceive the information that they receive. Regarding pretrial publicity, the individual that provides information about criminal cases can influence potential juror opinions about a defendant before their trial is complete, which can cause implications for final verdicts. This experimental study investigated the influence that communicator characteristics, specifically profession, had on people's opinions about a defendant's guilt. Using first-year psychology students from UTM (n=92), this research randomly exposed participants to one of three news articles presenting information about a criminal case by various relevant professionals (police officer, journalist, and defense attorney). Participants received other trial-relevant information before providing a dichotomous opinion about the defendant's guilt. All information provided to the participants was ambiguous to the actual guilt of the defendant. Overall, results showed a trend towards guilty opinions. A chi-squared analysis revealed a significant difference between the three profession types ($p=0.027$). Further post-hoc analyses attributed this significant difference to a difference in the number of guilty opinions provided by the defense lawyer and journalist profession groups ($p=.008$). Non-significant differences were found between the journalist group and the police officer group ($p=0.195$), as well as the police officer group and the defense lawyer group ($p=0.150$). These results suggest that although all the professions examined in this study increase guilty opinions, pretrial publicity provided by defense lawyers are the most likely to bias potential jurors towards guilty opinions about the defendant.

# Sabrina Demelo

## *Determining the Effect of the Prolific Offender Program on Crime Severity for Monitored Prolific Offenders in the Waterloo Region*

### ABSTRACT

The purpose of this research was to determine the effect of the Waterloo Regional Police Service's Prolific Offender Program on crime severity. This study compared the mean crime severity index (CSI) of 25 monitored and 25 unmonitored prolific offenders during pre-program (August 2016-May 2017) and post-program (May 2017-February 2018) periods. Additionally, trends in the number of offenses, proportion of breach charges, and the time in custody (for 7 monitored offenders) were analyzed. The mean CSI and number of offenses decreased between the pre- and post-program periods for both groups, however these changes were only significant for monitored offenders. A LS correlation analysis showed that there was a moderate to strong relationship between the CSI and number of offenses, suggesting that the significant decrease in offenses largely contributed to the observed decrease in CSI for monitored offenders. There was no significant difference in the time spent in custody and the proportion of breach charges for monitored offenders between the pre- and post-program periods, indicating that these factors were not responsible for the observed decrease in the number of offenses and CSI. It is therefore possible that aspects of the Prolific Offender Program unexplored by this study are responsible for these trends. It is recommended that future studies continuing to evaluate the program's effects over time incorporate external factors potentially influencing the behavior of prolific offenders.

**Keywords:** forensic science, forensic psychology, prolific offender program, Waterloo region, crime severity

**Supervisors:** Crystal Anderson and D/Cst. John Jaklitsch, Waterloo Regional Police Service

# Hafsa Saleem

## The Association between Urine Drug Testing (UDTs) and Substance Use Deterrence in Forensic Psychiatric Patients

### Abstract

The purpose of this research was to determine if there is an association between the frequency of urine drug tests (UDTs) administered and substance misuse among forensic psychiatric patients. Forensic psychiatric patients are individuals who have been adjudicated as not criminally responsible due to a mental disorder. The sample size for this study included 72 patients from the Centre for Addiction and Mental Health (CAMH), with a primary diagnosis of schizophrenia. The patient charts were coded to record the frequency of UDTs conducted in a 3-month period and the number of positive results for substance use during this period. Linear regression revealed a positive relationship between the frequency of UDTs and the presence of a positive result (OR = 1.18, $p$ = 0.01), indicating that patients tested at higher frequencies were more likely to yield a positive result. This was confirmed by a supplementary ANOVA, revealing that individuals who yielded one or more positive results in the study window had a higher mean frequency of being tested (M = 9.83, SD = 7.33) than individuals who yielded no positive results (M = 5.58, SD = 4.59), $F_{(1, 71)}$ = 7.14, $p$ < .01). Overall, results suggest that there is a relationship between the frequency of UDTs and substance use. This association was counter to expectations as the likelihood of discovering illicit substance use via UDT was directly linked to the frequency of testing. This study supports the need for more effective risk management strategies in forensic patient populations.

# Kahina Haroune

## *A 10-Year Retrospective Study of Miscarriage of Justice Arguments in the Ontario Court of Appeal*

**ABSTRACT**

This retrospective study assesses how the Ontario Court of Appeal decides and rules criminal defence arguments alleging miscarriages of justice. This study gives insight into the frequency of appeals allowed by the Ontario Court of Appeal when presented with a miscarriage of justice argument, the remedies granted once an appeal is allowed, and the frequency of fresh evidence applications being admitted. Using the LexisNexis legal database, the search was restricted to Ontario Court of Appeal cases from October 2008 (after the *Goudge Inquiry*) to February 2018. Of the resulting 489 cases, 168 were omitted in order to limit the scope of analysis to criminal cases, primary instances of appeal, and appeals brought forward by the defense counsel. The remaining 321 cases were analyzed and coded for the decision, the offence, whether the conviction arose from a trial or guilty plea, the remedy, and whether fresh evidence was admitted. The majority of cases (66%) brought forward to the Ontario Court of Appeal were dismissed. In the proportion of cases where appeals were granted (34%), the preferred remedy was a new trial (87.1%). Fresh evidence applications were brought forward in 23.1% of all appeal cases examined, in which 51.4% of these applications were admitted. A Yate's Chi Square Test revealed a statistically significant association between fresh evidence applications and the success of the appeal ($p < 0.05$). This study provides a better understanding of Ontario Court of Appeal decisions and offers novel systematic research on wrongful convictions in Ontario.

**Keywords**: forensic science, Ontario Court of Appeal, miscarriage of justice, fresh evidence, wrongful convictions

**Supervisor:** Caitlin Pakosh, Innocence Canada Senior Staff Lawyer

# 3:10 PM

# CLOSING REMARKS

## JOEL CAHN
FSC481Y Course Instructor
## Forensic Science Program
University of Toronto Mississauga

*RECEPTION IMMEDIATELY FOLLOWING AT*

*The Blind Duck
Student Centre*

*Until 5:00 PM*

*(Cash Bar)*

# CONGRATULATIONS

# FORENSIC SCIENCE

# INTERNSHIP

# CLASS OF 2018
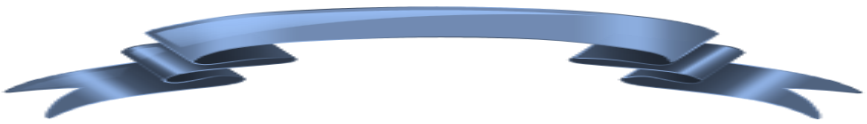
Grace Gregory-Alcock

Navneet Aujla

Andrés Rodríguez Betancourt

Joy Chen

Sabrina Demelo

Yee Tung (Charmaine) Fung

Grace Gao

Kahina Haroune

Michael Ho

Namrata Kochhar

Quan Le

Louise Lee

Long Hin Leung

Breanne Reidy

Hafsa Saleem

Elizabeth Steele

Claire Swanston

Aaron Yu

Qadija Yusuf

Cathy Zhao

# Special Thanks to This Year's Participating Mentors

| | |
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| **Crystal Anderson** | Waterloo Regional Police Service |
| **Clayton Asano** | Peel Regional Police Forensic Identification Unit, 22 Division, Brampton, ON |
| **Matthew Bowes** | Nova Scotia Medical Examiner Service |
| **Noel Christiansen** | M.E., RCMP Surrey Forensic Identification Division |
| **Loretta D'Costa** | Centre of Forensic Sciences Biology Section |
| **Rob Felske** | Forensic Identification Officer, Halton Regional Police Services |
| **John Fernandes** | Hamilton Regional Forensic Pathology Unit, Hamilton, ON |
| **Eveline Gallant** | Nova Scotia Medical Examiner Service |
| **Mathew George** | York Regional Police Forensic Identification Unit |

| | |
|---|---|
| **Robert Hofstetter** | Peel Regional Police Forensic Identification Unit, 22 Division |
| **John Jaklitsch** | Waterloo Regional Police Service |
| **Brad Joice** | York Regional Police Forensic Identification Unit |
| **Rasmus Rosenberg Larsen** | Forensic Science Program & Department of Philosophy, University of Toronto |
| **Eugene Liscio** | AI2-3D, Woodbridge, Ontario, Canada |
| **Jonathan Millman** | Assistant Section Head – Biology Section, Centre of Forensic Sciences |
| **Steven Nopper** | Halton Regional Police Forensic Identification Unit |
| **Jacqueline Osmond** | Centre of Forensic Sciences, Physical Sciences Unit |
| **Caitlin Pakosh** | Innocence Canada Senior Staff Lawyer |
| **Doug Penner** | York Regional Police Marine Unit |

| | |
|---|---|
| **Stephanie Penney** | Centre for Addiction and Mental Health (CAMH) |
| **Michelle Pflug** | Peel Regional Police Forensic Identification Unit, 22 Division |
| **Dax Urbszat** | Department of Psychology & Forensic Science Program, University of Toronto Mississauga |
| **Curtis Williamson** | Curtis Williamson, York Regional Police Forensic Identification Unit |
| **Susan Weir** | Ministry of the Environment and Climate Change |
| **Kona Williams** | Ontario Forensic Pathology Service, Office of the Chief Coroner for Ontario |

# FORENSIC SCIENCE PROGRAM
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FSC Program Internship Coordinator, Forensic Science Program

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Lecturer, Forensic Science Program
FSC481Y COURSE INSTRUCTOR

**Murray CLAYTON**
FSC Program Community Outreach Coordinator

**Marc DRYER**
Senior Lecturer
Biomedical Communications, Department of Biology

**Agata GAPINSKA** (On Leave Until July 1, 2018)/
**Ernest PRACK** (Interim, until June 30, 2018)
Lab Technicians
Forensic Science Program &
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**Wade KNAAP**
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UTM and AstraZeneca Chair in Biotechnology

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**Rasmus Rosenburg LARSEN**
Visiting Assistant Professor, Forensic Psychology and Philosophy

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Ontario Forensic Pathology Services

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Lafontaine & Associates, Barrister & Solicitor (Criminal Law) &
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Centre of Forensic Sciences

# ADJUNCT PROFESSORS

**Eugene LISCIO, PENG**
**Karen WOODALL, Hons BSc, MSc, PhD**

# PROFESSORS EMERITI

**W. Raymond CUMMINS, BSc, PhD**
**F. Jerry MELBYE, BA, MA, PhD, DABFA**

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# FORENSIC SCIENCE
## UNIVERSITY OF TORONTO MISSISSAUGA

# 2017-2018

## FSC COURSE INSTRUCTORS
## &
## TEACHING ASSISTANTS

### FSC100H5   The Real CSI

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Department of Anthropology
University of Toronto
Lecturer, Forensic Science Program

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**Sheryl Spielgeski, BSc, MSc, PhD Candidate**
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### FSC239Y5  Introduction to Forensic Science

**Vivienne Luk, BSc, MSc, PhD**
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**Emma Tytanek, BSc, MSc Student (Head TA)**
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## FSC271H5   Ethics and Professionalism in Forensic Science

**Karen Woodall, MSc, PhD**
Toxicology Section
Centre of Forensic Sciences

## FSC271H5   Teaching Assistant

**Elyssa Bader, BSc, MSc, PhD Candidate**
Department of Molecular Genetics
University of Toronto

## FSC300H5   Forensic Identification
## FSC302H5   Advanced Forensic Identification
## FSC303H5   Techniques of Crime Scene Investigation

**Wade Knaap**
Lecturer, Forensic Science Program, University of Toronto Mississauga,
Detective Constable (Retired) Toronto Police Service, Forensic
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## FSC300H5   Teaching Assistants

**Tori Berezowski, BSc, MSc Student**
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University of Toronto

**Elisabeth Cuerrier-Richer, BSc, MSc Student**
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## FSC302H5   Teaching Assistants

**Melissa Bernard, BSc, MSc Student**
Department of Anthropology
University of Toronto

**Vanessa Rossi, BSc, MSc Student**
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**Jessica Piekny, HBSc**
Forensic Science Program, University of Toronto
(Crime Scene Support Technician Toronto Police Service –
Forensic Identification Services)

## FSC311H5   Forensic Chemistry

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Assistant Professor, Teaching Stream
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## FSC311H5   Forensic Chemistry Teaching Assistant

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Department of Chemistry
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## FSC315H5   Forensic Biology

**Christian Taylor, BSc, MSc**
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## FSC316H5   Forensic Anatomy

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Associate Professor, Pathology & Molecular Medicine, McMaster University
Chief, Hamilton Regional Laboratory Medicine Program,
Program Director, Forensic Pathology

## FSC316H5   Sessional Instructional Assistant

**Ian Bell, BA, MSC**
Laboratory Manager
Department of Surgery - Division of Anatomy
University of Toronto

## FSC350H5   Special Topics In Forensic Science
## *(Topic) Psychopathy: The Science of Evil*

**Rasmus Rosenburg Larsen, BA, MA, PhD**
Visiting Assistant Professor
Forensic Science and Department of Philosophy

## FSC350H5   Special Topics In Forensic Science
## *(Topic) Analytical Toxicology*

**Vivienne Luk, BSc, MSc, PhD**
Assistant Professor, Teaching Stream
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University of Toronto

## FSC360H5   Evidence, Law and Forensic Science in Canada

**Vincenzo Rondinelli, LLB, LLM**
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Lafontaine & Associates, Barrister & Solicitor (Criminal Law) &
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**Melanie Markovic, BSc, MSc, PhD Student**
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Faculty of Medicine, University of Toronto

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Forensic Pathologist
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AND

**Kona Williams, MD, FRCPC (Course Coordinator)**
Forensic Pathologist
Ontario Forensic Pathology Services

## FSC401H5   Forensic Pathology Teaching Assistant

**Ashley Smith, MSc PhD Candidate**
Department of Anthropology
University of Toronto

## FSC402H5   Forensic Toxicology

**Vivienne Luk, BSc, MSc, PhD**
Assistant Professor, Teaching Stream
Forensic Science Program
University of Toronto

## FSC406H5   3D Crime Scene Mapping And Reconstruction

**Eugene Liscio, PEng**
Adjunct Professor, Forensic Science Program
University of Toronto
AI2-3D Forensics

AND

**Daniella Stoewner, HBSc**
3D Forensic Technologist
AI2-3D Forensics

## FSC406H5   Teaching Assistant

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University of Toronto

## FSC407H5   Forensic Identification Field School

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Forensic Science Program
University of Toronto

## FSC481Y5   Internship in Forensic Science

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Lecturer, Forensic Science Program
University of Toronto

## FSC481Y5   Teaching Assistants

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Forensic Science Program/Department of Anthropology
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# NOTES

# NOTES

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