

DPES

DIGEST

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EDITORS:

**DR.
SHADI
DALILI**

**HARRY
XU**

Photo: Harry Xu



“I (we) wish to acknowledge this land on which the University of Toronto operates. For thousands of years it has been the traditional land of the Huron-Wendat, the Seneca, and most recently, the Mississaugas of the Credit River. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.”

- University of Toronto,
Land Acknowledgement



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From The Sustainability Office

EDITOR FAREWELL

Dr Shadi Dalili

[HTTPS://WWW.UTSC.UTORONTO.CA/PHYSSCI/DPES-DIGEST-NEWSLETTER](https://www.utsc.utoronto.ca/physsci/dpes-digest-newsletter)



Shadi Dalili, DPES Digest Editor
Nov 2017-June 2023

About me:

As most readers probably already know, I am an Associate Professor, Teaching Stream here at DPES. I mainly teach the 2nd year introductory organic chemistry course (CHMB41H), as well as supervise directed research students in PSCB90 and CHMD90Y/CHMD91H.

How did you get started with DPES Digest?

A departmental newsletter had always been a long time vision of our Chair, Prof Arhonditsis, and I have always enjoyed writing, editing, and publishing. Thus, in 2017, not knowing what I was signing up for (!), I volunteered to start the DPES Digest, and the inaugural issue was sent out as a one page flyer in Nov 2017.

The newsletter has evolved tremendously since then, with the help of dedicated student volunteers and contributions from our graduate team, faculty, staff, students, alumni, TRACES and of course C.C. and Tom for all the great pictures. I am humbled to have been entrusted with this task for the past five and half years, and look forward to seeing its continuation and further expansion.

What has been the most enjoyable part of working on the DPES Digest?

I especially enjoy finding the information for an article, putting together the various parts and as mentioned above, writing, editing and publishing in general. In a different life, had I not gone into chemistry, I might have been in editing and publishing! As an editor, I really enjoyed hearing the ideas of the editorial team for articles and topics of interest to include in each issue. Overall, I got the most pleasure learning about all the amazing accomplishments of our students, faculty, alumni, and staff - I don't think there is an award that at least one person at DPES hasn't won!!

What is your favorite piece or part that you've worked on?

Having edited and published 32 issues since Nov 2017, it's very hard to remember, much less decide, on a favorite piece or part! However, it would probably be the March 2022 issue overall and the article: "*Unconscious Bias 101 and 102 Workshops*" in particular, which provides a wealth of information from TIDE (Toronto Initiative for Diversity and Excellence) on equity, diversity, inclusivity and bias. It was one of the pieces where I gathered, summarized, formatted, and distilled the content for the whole article from start to finish, and really learned a lot myself about these important topics, which I felt were pertinent to disseminate to the broader DPES community.

JEWISH HERITAGE MONTH

Jewish Heritage Month is usually celebrated in May in Canada. Established in 2018, this month serves as an opportunity to recognize and celebrate the experiences and resilience of Jewish communities, both throughout history and ongoing throughout their lives today.

May was chosen for Jewish Heritage Month due to its meaningfulness to the global Jewish community. One important Jewish holiday that often takes place during May is Shavuot, or the “Feast of Weeks”. Shavuot is a two-day festival during late May or early June which commemorates the end of spring harvest and the giving of the Torah.

Jewish Heritage Month is an opportunity to celebrate all contributions of Jewish Canadians while also reflecting on, and actively combatting past and present acts of racism, discrimination, and violence directed at Jewish communities. Celebrations of Jewish heritage during May remind us to continue to work against antisemitism that still actively persists in Canada and around the world today.

The University of Toronto held various workshops on celebrating Jewish heritage and fighting antisemitism at the University and across Canada this past May. The University is also proud to be affiliated with Mount Sinai Hospital, whose history began with four women from Toronto’s Jewish community gathering donations to build a hospital where Jewish doctors could practice medicine. Founded originally as the Hebrew Maternity and Convalescent Hospital in 1923, it remains today as a community-driven, innovative and world-class institution.

Resources:

<https://www.hebcal.com/holidays/shavuot-2023>

<https://socialwork.utoronto.ca/news/2023-jewish-heritage-month-resources-events/>

<https://www.sinaihealth.ca/about-sinai-health/sinai-health-system-history/mount-sinai-hospital-history/>

INDIGENOUS HISTORY MONTH

The month of June is celebrated as National Indigenous History Month, an opportunity to recognize the strength and resilience of Indigenous communities across the land now known as Canada, and a reminder to continue actively working towards reconciliation. Within the month of June, Canada also recognizes June 21st as National Indigenous Peoples day. They are both a celebration of the culture and knowledge of First Nations, Métis, and Inuit communities.

There are endless lessons and guidance to be learned from Indigenous peoples. Indigenous communities have lived on this land from time immemorial and continue to do so today. It is crucial to acknowledge both the historical and ongoing colonialism that impacts Indigenous communities. Reconciliation is continuous, complex, and multifaceted. It involves learning about Indigenous history, challenging the inequalities that exist between Indigenous peoples and non-Indigenous Canadians, and supporting the identity, languages, and cultures of Indigenous communities. We all have a responsibility to actively participate in reconciliation, and learn from and respect Indigenous communities.

The University of Toronto Scarborough's Equity, Diversity, and Inclusion Office has many resources to learn more about reconciliation and Indigenous communities, and offers many workshops and events to incorporate Indigenous knowledge and culture into our campus. For an overview of their resources, initiatives, and services, please visit their Indigenous Initiatives website: <https://edio.utsc.utoronto.ca/indigenous-initiatives/about-us>



PRIDE MONTH



June is celebrated annually as Pride Month, during which we celebrate the excellence and strength of the 2SLGBTQ+ community while actively working against homophobic and transphobic discrimination and violence. Individuals from the 2SLGBTQ+ community have made incredible historic contributions to Canadian history, and continue to do so today. Beyond this month, our Pride celebrations commemorate these contributions, and provide a space for Indigenous and Two-spirit, queer and trans-Black, and racialized queer and trans individuals to share their stories and experiences.

Pride celebrations were inspired by the Stonewall riots in 1969, held in response to the violent police raids at the Stonewall Inn in Greenwich. These protests and demonstrations led by powerful 2SLGBTQ+ individuals continue to inspire the community today. Toronto Pride in particular is influenced by a long history of advocacy and support that includes the protests held after Operation Soap, a series of bathhouse police raids in 1981 that resulted in 286 men arrested.

The University of Toronto is celebrating Pride month with various events held tri-campus wide. The Pride flag was raised at all three campuses on the first of the month. Pride Pub is co-hosted annually by the Sexual & Gender Diversity Office and Hart House at the St. George campus. This year the event took place on June 9, 2023 and featured powerful performances by members of the Toronto 2SLGBTQ+ community. The fourth annual Pride Pitch event was held at UTM on June 14th, which encouraged students, staff, and faculty from all three campus and community members to pitch their start-up ideas for over \$5000 in available cash prizes. The University also had a team for the Pride and Remembrance Walk, which is a fundraising walk that took place on June 24th, raising money for multiple beneficiaries including Asian Community AIDS Services, Black Coalition for AIDS Prevention, Buddies in Bad Times Theatre, 519 Church Street Community Centre, and Pride and Remembrance Foundation.

Resources:

<https://people.utoronto.ca/news/recognizing-pride-2023/>

<https://www.priderun.org/>

COVER STORY

2023 JUNE CONVOCATION

CELEBRATING THE BRIGHT FUTURES OF OUR GRADUATING STUDENTS

PHOTOS BY CHAI CHEN AND HARRY XU

We are delighted to extend our warmest congratulations to the remarkable students of the Department of Physical and Environmental Sciences who have successfully graduated from University of Toronto Scarborough. These talented individuals have reached a significant milestone in their academic journey, and we couldn't be prouder of their achievements.

Throughout their time with us, this exceptional cohort have showcased unwavering dedication, perseverance, and an unquenchable thirst for knowledge. Their commitment to excellence has not only enriched our department but also inspired their peers and mentors.



We extend our heartfelt appreciation to the faculty, staff, and families who have supported these students every step of the way. Your unwavering guidance and encouragement have played a pivotal role in their success.



As the new graduates embark on new adventures and enter the professional world, we have no doubt that they will continue to make remarkable contributions and shape the future in their chosen fields.

To our graduating students, as you move forward, remember to embrace the challenges that come your way, for they are opportunities in disguise. Cherish the memories you have made here and carry the knowledge you have acquired into the world, making a positive impact wherever you go.





Congratulations, Class of 2023! We are immensely proud of each and every one of you. As you spread your wings and embark on this new chapter, know that you have the support and admiration of the entire DPES family. We wish you a future filled with boundless opportunities, personal growth, and endless success!



NEW FACULTY HIRE

DR CODY ROSS

(excerpts of the following sections has been taken from DPES Chair communications)



We are delighted to share the great news that **Dr. Cody Ross has accepted our offer of hire and will be joining the department, effective July 1, 2023.** Dr Cody Ross is currently an Assistant Professor Teaching (LTA) in the Department of Geography, Geomatics, and Environment at the University of Toronto Mississauga, where he is responsible for courses in Physical Geography and Global Weather and Climate. Additionally, he has experience with course development and delivery at the Toronto Metropolitan University, where he introduced an applied data analysis course aimed at enhancing statistical and computer programming literacy among graduate students in the Environmental Applied Science and Management program. His teaching approach strongly features experiential learning that actively develops interdisciplinary skills to prepare students for fulfilling careers in academia, government, or private sectors. He obtained his M.Sc. in Geological Sciences with a specialization in hydrology from the Department of Earth Sciences at the University of Manitoba (UM) with a focus on riparian-to-stream water movements in a multitude of hydro-geomorphic settings. He continued at UM for his doctoral research, obtaining a Ph.D. in Geological Sciences with a specialization in hydrology. He studied thresholds in rainfall-runoff relationships for a wide range of environments, spanning seven study areas and four countries with a specific focus in assessing the ubiquity of rainfall-runoff thresholds. Currently, he is a postdoctoral fellow at Toronto Metropolitan University, where he leads a project – in collaboration with the Ontario Ministry of Environment, Conservation, and Parks (OMEC) – developing new models for predicting sediment and nutrient export from streams using data from environmental sensors. He is the author of multiple papers in high profile journals (e.g., Science of the Total Environment, Journal of Geophysical Research, Hydrological Processes, Water Resources Research).

The department would like to thank our search committee (Professors Heidi Daxberger, Stuart Livingstone, Carl Mitchell, Svetlana Mikhaylichenko, Karen Smith, and Vinh Quan as the Dean's representative) for their extremely hard work and thoughtful input along the process. It has been such a great joy to work as a team to successfully complete this faculty search. We also thank every single member of our community, who took the time to attend the seminars of the candidates and provide their input.

Welcome to DPES, Cody!!! We look forward to working together to further strengthen the profile of our beloved department (and our graduate programs) in Canada and beyond!

FACULTY AWARDS & ACCOMPLISHMENTS

KRIS KIM: ASSISTANT PROFESSOR AND LECTURERS TEACHING AWARD



The Department of Physical and Environmental Sciences is thrilled to announce that Professor Sanghyun (Kris) Kim is the recipient of the UTSC Assistant Professors and Lecturers Award. Professor Kim joined our department in July of 2019. Right from the beginning, he has brought enormous energy, enthusiasm, and creativity to our programs. His nomination package as well as his recent recognition with the highly prestigious University of Toronto Early Career Teaching Award provide overwhelming evidence that Professor Kim is truly a superlative educator.

His record includes very significant pedagogical contributions to departmental/divisional curricular initiatives and teaching committees. He teaches several important courses, ranging from a large introductory course (CHMA11) with an enrollment around 200, to a small research course (PSCB90) with fewer than 20 students. Kris is praised for being one of the active members of the first-year teaching team, having undertaken the task of revitalizing the first-year chemistry curriculum. The team has made impressive progress with updating both the lab and lecture curriculum to better align with our program needs. This includes the recent introduction of a writing assignment to the first-year courses, a LEAF-funded initiative which will help support our program-level learning outcomes. He also played an instrumental role in the successful proposal to offer a unique Nano Boot Camp experience at UTSC. The grant proposal for this bootcamp was awarded by the Office of the Vice Principal of Research and Innovation with \$100K in funding under an extremely competitive process. The inaugural offering of this bootcamp was a few weeks ago and our hope is that it will become a recurring event for years to come.

Another award Kris.....congratulations again....and again....and again!!

N. THAVARAJAH: PART-TIME FACULTY & CONTRACTUALLY LIMITED TERM APPOINTMENTS TEACHING AWARD

The Department of Physical and Environmental Sciences is thrilled to announce that Professor Nirusha Thavarajah is the recipient of the UTSC Part-time Faculty & Contractually Limited Term Appointments Teaching Award. Her nomination package as well as her recent promotion to Associate Professor, Teaching Stream (75% appointment) provide overwhelming evidence that Professor Thavarajah is a superlative educator, who has shown a sustained level of excellence in teaching at the undergraduate level.



Her pedagogical work has been supported by numerous teaching and pedagogy grants, from both external (eCampus Ontario) and internal (Global Classroom Grant, Pedagogies of Inclusive Excellence Grant, Teaching Enhancement Grant Professional Development Grant) funding sources. For her impeccable academic record, she has received the Dean's Merit Award twice and was the recipient of the University of Toronto Scarborough Teaching Award in the category of Unit 1 Course Instructors and Unit 3 Sessional Lecturers. She has also received the Junior Faculty Award for Excellence in Science Education, Young Investigator-The Best Presentation Award, and the Excellence in Education Award, presented by the Technological Advances in Science, Medicine and Engineering Committee Chairs, SickKids/University of Toronto. Professor Thavarajah is praised for her efforts to create course material and assignments that allow students to take ownership of their learning and embrace their cultural background and future career aspirations. She has also been successful to receive support from the Experiential Learning Funding and the Global Classroom Award 2021 to help students practice equity, diversity, and inclusion (EDI) integrated learning by building relationships with community partners, developing innovative ideas, and engaging in peer assessment and reflection. Congratulations to Professor Thavarajah!

UNIT 1 COURSE INSTRUCTORS TEACHING AWARD

The Department of Physical and Environmental Sciences is thrilled to announce that **Dr Kirsten Kennedy** is the recipient of the UTSC Unit 1 Course Instructors Teaching Award. Dr Kennedy has been a popular course instructor in our department for several years now, taking over from Professor Eyles to teach one of the most successful courses in the history of our department, EESA06, which attracts nearly 2,000 students every year. Based on a unique combination of thought-provoking lectures, virtual labs, and videos, her students partake in a global field trip that has proven to be a highly attractive introduction to our programs. Her highly successful involvement with some of our “specialist” courses, such as Sedimentology and Stratigraphy (EESB20), Earth History (EESB15), and Petrology (EESC36), provide overwhelming evidence of her commitment to field-focused teaching and experiential learning. Dr Kennedy has introduced a number of highly innovative teaching techniques, funded by several projects through the Learning & Education Advancement Fund, eCampus Ontario Open Content, and eCampus Ontario Virtual Learning Strategy. Her impressive nomination package provided overwhelming evidence that she is setting the brightest standard as an emerging all-around charismatic educator. Her unwavering commitment to teaching is supported by all the documents of her portfolio and enthusiastically reflected in the endorsement letters submitted by students. Congratulations, Kirsten, for this wonderful recognition!!



TEACHING ASSISTANT AWARDS

First time established in 2013-2014, the DPES Teaching Awards aim to recognize individuals who demonstrate excellence in teaching and have had an impact on the student experience in the context of their role as teaching assistants. This award is always very competitive and our Teaching & Curriculum Committee has seen some outstanding nominations over the years. The recipients of the DPES TA awards for 2022-2023 are as follows:

Qusai Hassan has excelled as a long-time TA for CHMB42 (Organic Chemistry II), delivering quality instruction in both tutorial and laboratory settings. He has also been a valuable member of the teaching teams in several other courses, as evidenced by the number of nomination/support letters received from four instructors (thank you to Dr Sauer, Dr Kim, Dr Dalili and Dr Zimmer)!! He is praised for being well-organized, dependable, and quick to offer help when needed. He is always among the first to respond to emails, complete his grading assignments and post student results. Over the years, his willingness to help out has come in many forms, from filling in for missing/ill TAs, to mentoring junior TAs on how to manage the large 40-student tutorials, or to troubleshooting their on-line delivery during the pandemic. The department commends Qusai for his hard work on improving the working conditions of our TAs over the past two years. Congratulations Qusai!

Tsuimy Shao, who (according to the introduction of her nominator, Lana Mikhaylichenko) "... ranks among the best teaching assistants that our department has to offer....thanks to her perseverance, creativity, self-motivation, maturity and passion for education. Tsuimy is a natural educator; she is the kind of teaching assistant who sees something that needs to be done and takes care of it without being asked. More than anyone I know, her interactions with students are supportive, impactful, and she does it gracefully and without a burden to the course instructor. She is approachable, helpful, and dedicated to her students.... She is not only an excellent TA in the lab, but also puts a huge effort to improve the quality of students' education and experience at all levels: laboratory, lecture and research." Congratulations Tsuimy!

Each award is valued at \$350. Warmest congratulations to both recipients! We very much appreciate your great work with our courses!

Special thanks to Prof Hadzovic and our Teaching & Curriculum Committee (<https://www.utsc.utoronto.ca/physsci/dpes-committees>) for their immense commitment to promote our teaching enterprise.

GRADUATE STUDENT BEST PAPER AWARD

(excerpts taken from DPES Chair communication)

The Department of Physical and Environmental Sciences had another exceptional year with seven (7) nominations of outstanding papers that reflected the diversity of research hosted in the department. The criteria used for the decision are the significance of each paper to the corresponding discipline, the student's role in conceiving and carrying out the research, and any other evidence (e.g., quality of the journal) for each paper to be considered for the award. For one more year, the sizable number of internal adjudicators of these nominations had a hard time agreeing on a single paper, and ultimately, consultation with two (external) editors of an international journal was necessary. Similar to last year's practices, even after the external consultation, there were two papers that received equally strong support without a meaningful tie-breaker.

I am delighted to let you know that this year's DPES Graduate Student Best Paper Award will be shared between **Mr Garrett Brown's** paper titled "*General relativistic precession and the long-term stability of the solar system*", published in the peer-reviewed journal *Monthly Notices of the Royal Astronomical Society* (Volume 521, Issue 3, March 2023, Pages 4349-4355), and **Mr. Mahendra Doraisami's** paper titled "*A database of wood carbon fractions across the world's trees and forests*", published in *Scientific Data* (9: 284).

In his paper, Garrett greatly enhances our understanding of the evolution of the Solar System. Quoting his supervisor (Prof. Hanno Rein) from his nomination, this paper represents one of the most important studies to come out of his group. He further adds "...The specific perturbations which Garrett has been looking at are post-Newtonian corrections originating from Einstein's equations of General Relativity (GR). These GR corrections play a crucial role in Mercury's precession rate. Any change to the strength of this GR precession will change the probability of the Solar System going unstable. Aside from cosmology, most experimental tests of GR only test the theory in the present. In contrast, Garrett has come up with an idea to place limits on how constant these relativistic post-Newtonian effects have been over billions of years. This is highly novel approach that has never been done before..." Hanno further adds that "...In short, Garrett has been able to show that the equations that Einstein came up with, are not only consistent with present day observations, but have also been valid for the last 5 billion years. This might not be surprising - we didn't expect Einstein to be wrong - but we provide rare and direct evidence that he was right...."

According to his supervisor's nomination (Prof. Adam Martin), Mahendra's study "...addressed a major gap in forest ecology and global change science, by consolidating and publishing the world's largest database for any wood chemical trait, and executing analyses on variation in "wood C fractions" (CFs) across trees globally. Specifically, in this paper, Mahendra independently led the consolidation of over 3,500 wood CF observations from >850 trees species across all forested biomes, into a single database named "The Global Woody Tissue Carbon Concentration Database (GLOWCAD).

Mahendra's paper and GLOWCAD support global assessments of wood C in trees, showing, most saliently, that existing forest C estimates have errors of approximately 4.8% on average as a result of overlooking variation in wood CFs. These results have major implications for understanding the magnitude and size of forest C pools and fluxes globally. Mahendra's paper also influences multiple avenues of applied forest C science. For instance, as part of Mahendra's ongoing PhD work, GLOWCAD is being integrated into the world's largest national forest C accounting programs (i.e., the Forest Inventory and Analysis of the USDA Forest Service)...."

Garett and Mahendra will receive \$1,250 each that could be used to attend a conference or to support any other activity pertinent to their research.

On a final note, the department is grateful to all of our colleagues, who devoted their time to put together the impressive nominations, as well as to the members of the adjudication committee, who provided their insights into the quality of the nominated papers. This award have become one of the major celebrations of the excellent scholarship produced by our students!!

DPES EXCELLENCE AND LEADERSHIP AWARDS

(excerpts taken from DPES Chair communication)

The department is delighted to announce the recipients of the DPES Excellence and Leadership Awards 2022-2023, sponsored by our TRACES Centre and Chemical Stores facilities. The following students are recognized for their excellent academic performance (their CGPAs vary from 3.9 to 4.0), as well as their impeccable record of leadership and contributions to our community through their participation into student organizations or other volunteer work related to DPES. They were all actively involved with the executive teams of the Environmental and Physical Sciences Students' Association and the Chemistry Society of UTSC. They supported the DPES community with a multitude of tutoring (Chemistry Help & Physics Study Centre) and outreach activities..... We are grateful for all their good work!

- (1) **Seviliya Gulyamova** (Major in Environmental Studies)
- (2) **Yao Yan Huang** (Specialist Co-op in Environmental Chemistry);
- (3) **Sukriti Kothari** (Major in Biochemistry)
- (4) **Ruchi Manish Soni** (Specialist in Physics and Astrophysics);
- (5) **Charlotte Wargniez** (Specialist in Environmental Geoscience & Minor in Applied Climatology).....this will be Charlotte's second time receiving this award!

It has been such a great joy to witness their tremendous assistance in advancing the department and cultivating the sense of community! Each award is valued at \$300.

ROSE SHEININ AWARD

(excerpts taken from UTSC Daily Update)

Charlotte Wagniez is graduating at age 17 from U of T Scarborough with a major in environmental geoscience. She's also the first and only student to graduate with U of T Scarborough's minor in applied climatology. This fall, Charlotte is off to the University of Oxford in pursuit of her masters of science in sustainability, enterprise and the environment.

She was also this year's recipient of the Rose Sheinin Award, given to the highest performing woman student in science across U of T's three campuses.



Environmentalism has been the cornerstone of her extracurricular life too, largely through Regenesis UTSC, a student group dedicated to creating and raising awareness of environmental and sustainability initiatives. She led the team as co-president to revive U of T Scarborough's free store and create a bike sharing centre on campus — projects that both won Adam's Sustainability Grants. She also became vice-president of academic affairs with the environmental and physical sciences students' association (EPSA), a group that works with DPES to host programming, outreach, tutoring and field trips, as well as their first gala this past academic year.

She says her age didn't present many challenges at university. The pandemic hit during her first year, though she still made lasting friendships while living on campus and partaking in research projects. She's felt the need to hide her age for the last four years — particularly from students when she became a teaching assistant. She says this article will be the first time many of the people she's connected with at university will learn how young she actually is.

"I think she's just the sort of person we need in the realm of policymaking for environmental problems and issues, someone who has a thorough understanding of science, how the world works, is experienced, has met a lot of people and has that discipline," Professor Nick Eyles says.

"I want to keep my mind open to anything that will come," she says. "I know how I want to impact this world, and whatever I find that will work best for me, I'll take it."

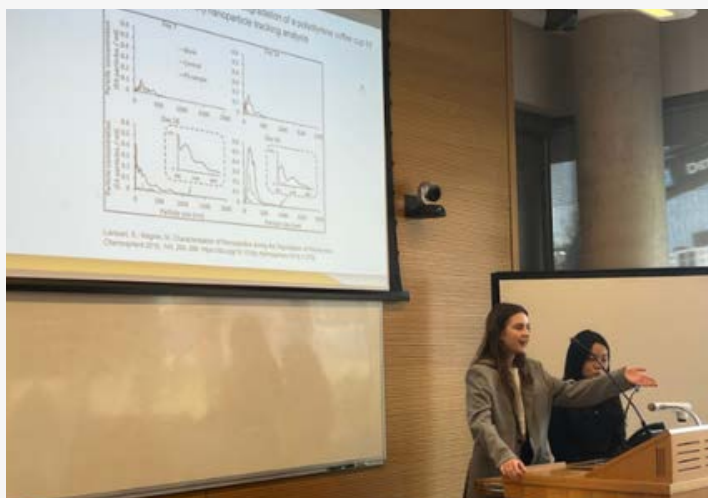
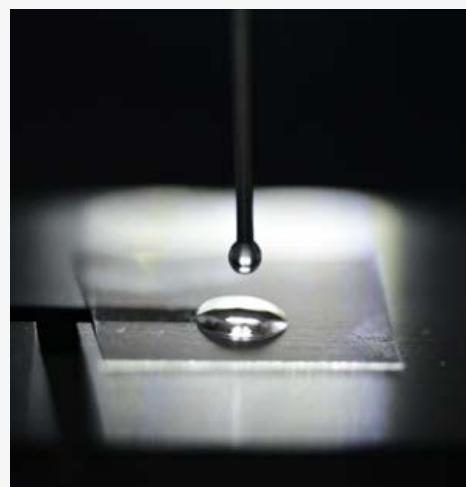
For the full story, head over to: <https://utsc.utoronto.ca/news-events/our-community/u-t-scarborough-grad-started-university-13-now-shes-oxford>

DPES NANO BOOTCAMP

By: Professor Kris Kim

From May 1-12, 2023, students in DPES were invited to join the first ever Nano Bootcamp. The 10-day bootcamp offered undergraduate students an opportunity to learn new lab skills and techniques related to the synthesis and characterization of nano materials, attend guest lectures and network with faculty and industry partners, and participate in group-based case studies that address real world challenges through the design and application of nanomaterials. Experiments that students got to participate in included the synthesis and characterization of various nanomaterials, including (1) reduced graphene oxide, (2) iron nanoparticles, (3) polydopamine nanoparticles, and (4) polymer films. Students also gained hands-on experience collecting data using a wide array of techniques and instruments in our Surface and Interface Characterization Centre (SICC), including contact angle, dynamic light scattering, and atomic force microscopy.

This work was presented by Anna Galang and Lana Mikhaylichenko at the Canadian Chemical Conference and Exhibition in Vancouver, BC on June 7th, 2023.



COURSE FEATURE: EESD33

With Professor Mandy Meriano

Dr. Mandy Meriano specializes in groundwater flow and impacts of urban development on water quality and quantity and understanding the linkages between groundwater and surface water using analytical, geochemical, and numerical modeling.



In May, a new cohort of EESD33 Field Technique students spent two weeks in the field and the lab, navigating their valuable in-class fieldwork experience. As an essential course for aspiring geoscientists, EESD33 focuses on building a strong, comprehensive foundation in field concepts and methodologies. Through a blend of hands-on fieldwork and laboratory analysis, students will gain proficiency in quantitative and qualitative methods for collecting environmental data. The curriculum aligns with the requirements of the Association of Professional Geoscientists of Ontario (APGO) for obtaining a **Professional Geoscientist (P.Geo) Certification**.



a. Professor Meriano demonstrating the use of a water tape



b. Professor Meriano and course TA Phillip Ruscica installing the piezometer

COURSE FEATURE: EESD33

With Professor Mandy Meriano

By the end of the course, students will possess the practical skills necessary to investigate and characterize surface and subsurface systems, use state-of-the-art techniques for soil/water sampling, monitoring, and evaluating surface and groundwater systems, with a particular emphasis on contaminated systems, aquifer testing, surface/groundwater interactions, and geophysical techniques.



c. Drilling a water level monitoring well



d. Students priming the well

The pre-work field experience will provide students with an opportunity to immerse themselves in nature, think critically about sustainability and other societal environmental-related issues, while gaining practical knowledge. They may encounter technical challenges during the experience, but it will allow them to understand how science is applied in real-life conditions and better prepare them for future careers.



e. Logging core samples



f. Students analysing seismic data



g. Student measuring elevation using engineering level

COSTA RICA FIELD CAMP COURSE: AN UNFORGETTABLE EXPERIENCE!

By: Yao Yan Huang

The contents of this article reflects the author's personal opinions.

From the first moment I got off the plane in San José, I knew I was in for the experience of a lifetime. It was my first time in Costa Rica, my first time even being in Central America, and here I was about to spend 12 days traveling the country and learning about environmental sciences and geology. I was here as part of the field camp course EESC16 and EESD16 (if you've already been on a field course). It was a small class, only 14 people plus our instructor and guide Professor Ken Howard, his wife and geologist Karina, and our bus driver Franklin.



The itinerary map

The first three nights were spent in La Fortuna, a small town in Costa Rica, northwest of the capital, San José. We learned about the two nearby volcanoes, Arenal Volcano and the now dormant Chato Volcano. The town got its name when its

inhabitants were lucky enough to survive the eruption of 1968 that decimated much of the area. We hiked through Arenal Volcano National Park, swam under Chato waterfalls, and visited the hydroelectric dam of Arenal Lake, exploring both the wildlife and geological history of the region. My highlight had to be visiting the Venado Caves, where the limestone cave walls originally formed under the ocean in the Miocene era. There was a moment when we all turned our headlamps off and just sat in silence contemplating the impenetrable darkness.



Arenal Volcano and tributary river (left) and cave crickets in Venado Caves (right).

Our next stop was Rincón de la Vieja Volcano National Park, in the Guanacaste Province. Here we explored geothermal surface expressions like fumaroles, hot gas, and hot springs, and other sights the park had to offer. While the park springs consisted of muds and acids and temperatures

generally unsafe for human entry, there were also hot springs at the resort perfect for winding down after a busy day. We did some temperature tests there to see if the recent volcanic activity had any impact on temperature. We also took a drive out to the outer regions, exploring the exposed rock layers and the Colorado River, Costa Rica (not to be confused with the Colorado River, USA which heat-addled students thought were one and the same for a moment)!



The Rincón de La Vieja hot springs (do not swim here).



Rincón de la Vieja hot springs (do swim here). Pura Vida!

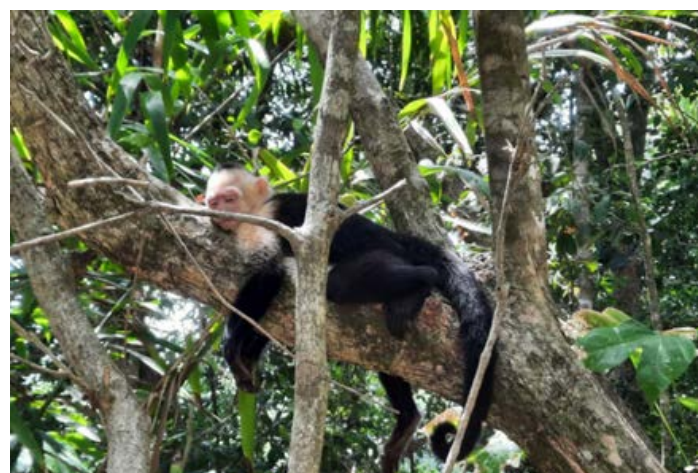
Our next stop was the coast, filled with sunny skies and endless coastal beaches. Manuel Antonio National Park was the perfect place to spend a day

learning about mangroves and coastal geology. It was also perfect for an afternoon dozing off at the beach or catching some waves in the warm Pacific ocean (some of us caught more than just waves when the tide came up).

We stayed at Hacienda Barú Lodge, a once cattle ranch turned wildlife refuge, that hosted an impressive array of trails and wildlife. I saw white-faced capuchin monkeys, toucans, the capybara like agouti, and a whole family of wild pigs, collared peccary. The sloths were a bit harder to find as they don't move high up in their treetop perch but we finally spotted them on the last day while zip-lining. Myself and many of us also became intimately familiar with the local mosquitoes.



Manuel Antonio National Park.



A sleepy white-faced capuchin monkey in Manuel Antonio National Park.



Folds of a syncline at low tide.

Finally, it was time to move inland again, where the high altitude provided a much needed relief from the heat. We were travelling right at the beginning of the wet season and luckily (or unluckily due to the humidity) it only rained once when we were inside the caves. The drive up the winding mountain roads was a memorable experience as it felt like we were driving through clouds; each bend would reveal another view of the valley of grazing cows and farmland.

The view from Irazú Volcano is also one that I will not forget soon. It was a spectacularly clear day where the craters were clear and the peaks of nearby volcanoes could just be spotted between the clouds. Irazu is the tallest active volcano in Costa Rica at an elevation of 3,432 m, which was definitely noticeable. Myself and some others found that even a few steps left us winded, with symptoms including nausea and dizziness.



Irazú Volcano from the summit.

Costa Rica Then & Now

Perhaps it is because I am graduating this year but something that really struck me on this course was the feeling of the passage of time. Humans tend to have trouble contemplating deep time, also known as the time scale of geologic or cosmic events, which tends to be unimaginably greater than the time scale of human lives and human plans. The Costa Rican volcanoes were erupting at the same time North America was in an ice age and covered in ice sheets. Turbidites were formed and folded at the bottom of the ocean tens to hundreds of million years ago and now moved above sea level to where one can see them. Being there in person, seeing the landscape and examining the minutiae helped me to paint a picture of what the words "20 million years ago" really meant. The earth is changing, constantly, slowly. The ground below us is active and alive although we can not see its form. We can learn about the past from current observations and clues but we will not be alive to see its future form.

On the other side of things is how quickly things can change. When talking about primary and secondary succession, our instructors remarked about a forested area that only 10-20 years ago was still a cooling bed of lava or deposits of pyroclastic flow. Costa Rica has also changed. Its tourism industry has grown rapidly; Professor Howard talked about when the national parks system and all the hot spring resorts and hotels didn't exist. Rivers have been excavated for construction and diverted for agriculture. Whole hillsides have been cleared away mining for gold and other precious metals.

Change is inevitable. But as scientists, and especially environmental scientists, we have a duty to guide it. We must add our voices to ensure that decisions for the future are based on sound scientific reasoning.



1992/1993 Blocky lava flow at Arenal Volcano in late 90s (left), the same region in 2006 with beginnings of vegetation (middle), and that region in 2023 (right).

Should I take this course?

Without considering other factors, my vote is a resounding yes! Costa Rica is a beautiful country with such diversity of landforms and ecozones that made it the perfect place to conduct a field course like this. However, as students, I know that there are a lot of other factors to consider. This is a winter course, however, it runs after exams and into May (this year Apr 28-May 10), so if you are working in the summer or taking courses, some scheduling or taking time off might be required. There are also additional costs to consider on top of course fees, outlined to the right. This was also a physically demanding course; you don't need to be a gym buff but will have to be comfortable traveling and walking out in the sun all day. However, please don't let that discourage you from signing up! If there are any accessibility concerns, they can be discussed ahead of time with the course instructor, the department, or with accessibility services.

EEESC16H3: Field Camp I

Link to UTSC Timetable:

<https://utsc.calendar.utoronto.ca/course/eesc16h3>

Cost Estimate 2023 - for reference only

\$USD 1100 - This discounted price includes a bus, driver, all accommodation and breakfast for 12 nights, all National Parks fees and landmarks, and a zip-line tour at Hacienda Baru (bundle sent to course instructor).

USD \$300-350 - food, souvenirs, personal purchases

USD \$600-800 flight

USD \$450 - course fees on ACORN CAD \$610 (domestic, course fees may vary depend on the year)

Total: USD \$3100

Financial Assistance

- Global Learning Travel Fund
<https://www.utsc.utoronto.ca/studentexperience/global-learning-travel-fund>
- Internal Experience Award
https://learningabroad.utoronto.ca/learning-abroad/prepare_plan/funding/centre-for-international-experience/

MENVSCI INTERNSHIPS

As a celebration of the end of our graduate seminar course EES1100Y, DPES generously funded a student-led end of the semester celebration at the end of March! Our students organized a **Caribbean Night** full of delicious food and fun games for their entire cohort. One of our students, Anannya Sahadev, brought an MEnvSc inspired cake (right).



Overall it was a great event and the students enjoyed the peer to peer interaction before heading out on their Summer 2023 internships.

You can find a great post about this event on LinkedIn: https://www.linkedin.com/posts/joanna-ying-fiss_utscmenvsc-uoft-utsc-activity-7047339205915521024-5HxCutm_source=share&utm_medium=member_desktop

In addition, as of May 2023, our Internship cohort of MEnvSc students have all officially begun their 2023 Summer internships. We wish them all the best as they settle into their new roles!



FROM THE TRACES CENTRE

INSTRUMENT FEATURE: GCMS

GC-MS Basics

The purpose of coupling gas chromatograph (GC) with a mass spectrometer (MS) is to provide identification of an analyte of interest without requiring further analysis. GC can separate many volatile and semi-volatile compounds but not always selectively detect the constituents. The MS can selectively detect many compounds (by fragmentation pattern) but not always separate them. This is the basis for the operation and use of a GC-MS. In most cases, parallel properties (retention time, isotope ratios) are required to consider the results confirmatory.

GC-MS...How can that work?

A major concern coupling a GC to a MS is the significant differences in pressure-the GC gas exiting the system is around one atmosphere (760 torr) whereas the MS operates at a vacuum of around 10^{-6} torr. . This issue was solved in capillary GC columns by having the GC gas flow kept low (<4 ml/min) and the pumping speed of the MS vacuum system is high (~20L/sec) then all of the GC effluent can be passed into the MS. With this setup, the capillary GC column directly inserted into the ion source.

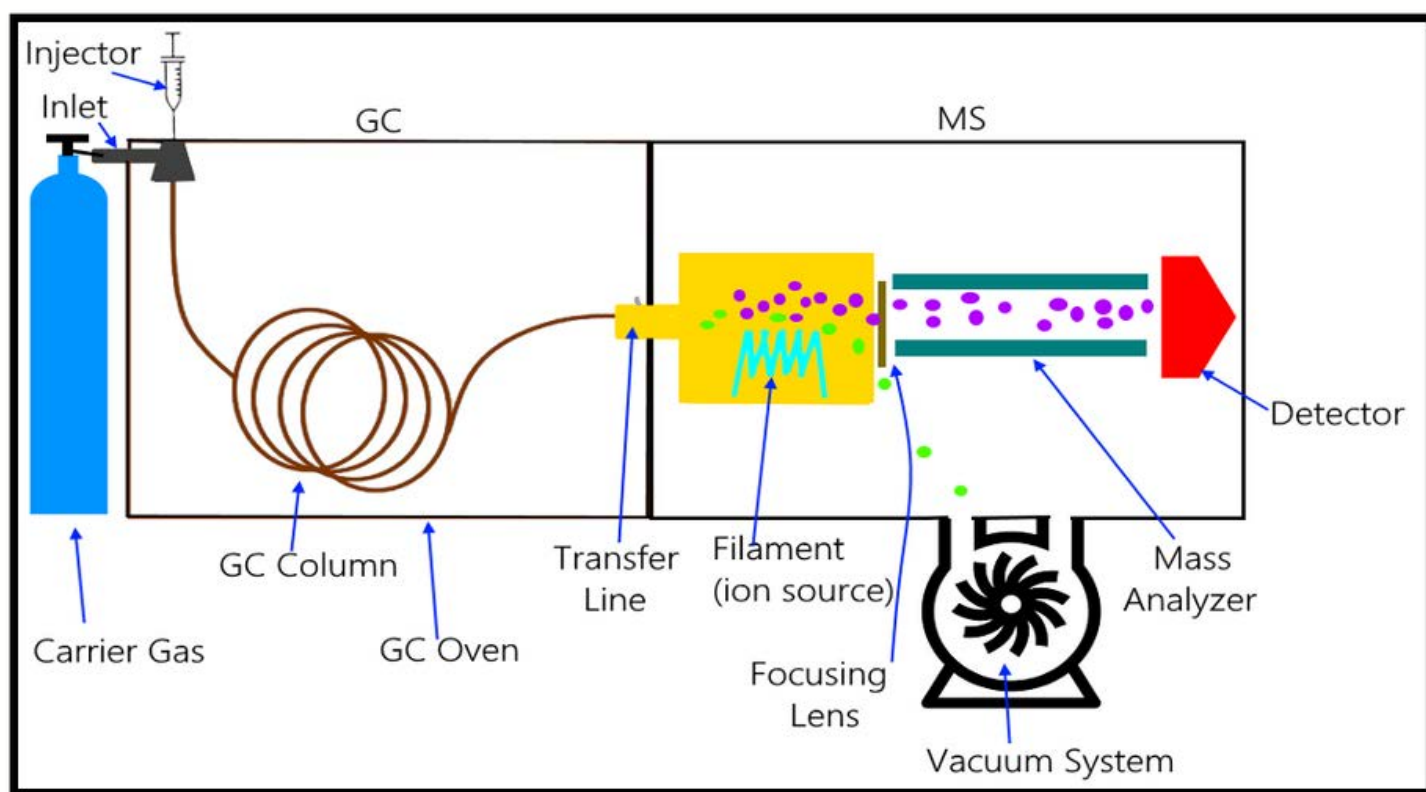
GC-MS Instrument Principles

The sample is injected manually or by automation. As the effluent are separated in the GC column into 'individual compounds' they elute from the GC. The compounds enter the MS, and the electron ionization (EI) source generate ions. The generation of ions, results from using a stream of electrons ionizing the molecules and causing them to fragment. The mass of the fragment divided by the charge is the mass charge ratio (m/z). For a GC-MS, using an electron ionization (EI) source the charge is usually +1, and m/z ratio represents the molecular weight of the fragment. A group of four electromagnets, a quadrupole, focuses each fragment through a slit into the detector. These quadrupoles are tuned by a computer to direct only certain fragments (please see How Quads Work). The computer has the quadrupoles, which cycle these fragments one at a time (scan) until the range of m/z is completed. This produces the mass spectrum; signal intensity (relative abundance) versus m/z ratios (approximate molecular weight). The knowledge that most compound (enantiomers excluded) has a unique fragmentation 'fingerprint' and software is readily available to provide a library of spectra for known compounds and comparing them to the fragmentation in question. It is easy to see the power behind the GC-MS.

FROM THE TRACES CENTRE

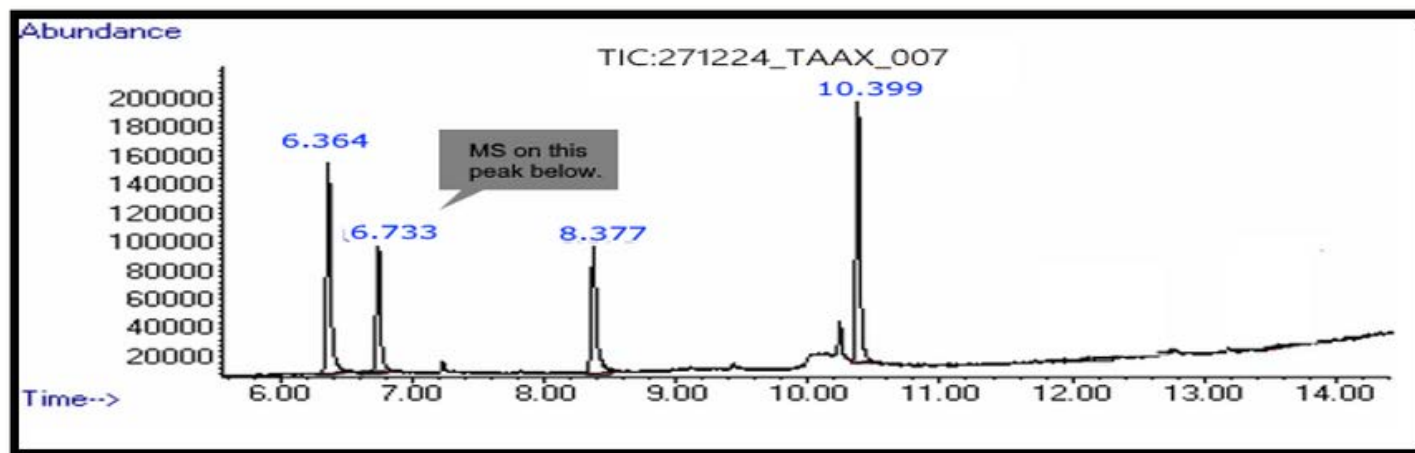
INSTRUMENT FEATURE: GCMS

GC-MS Instrumentation



GC-MS Chromatogram

The total ion chromatogram (TIC) below, represents the retention time (x-axis) plotted against the intensity of all the spectral signals (abundance). The peaks may represent one or more compounds eluting through the GC Column.

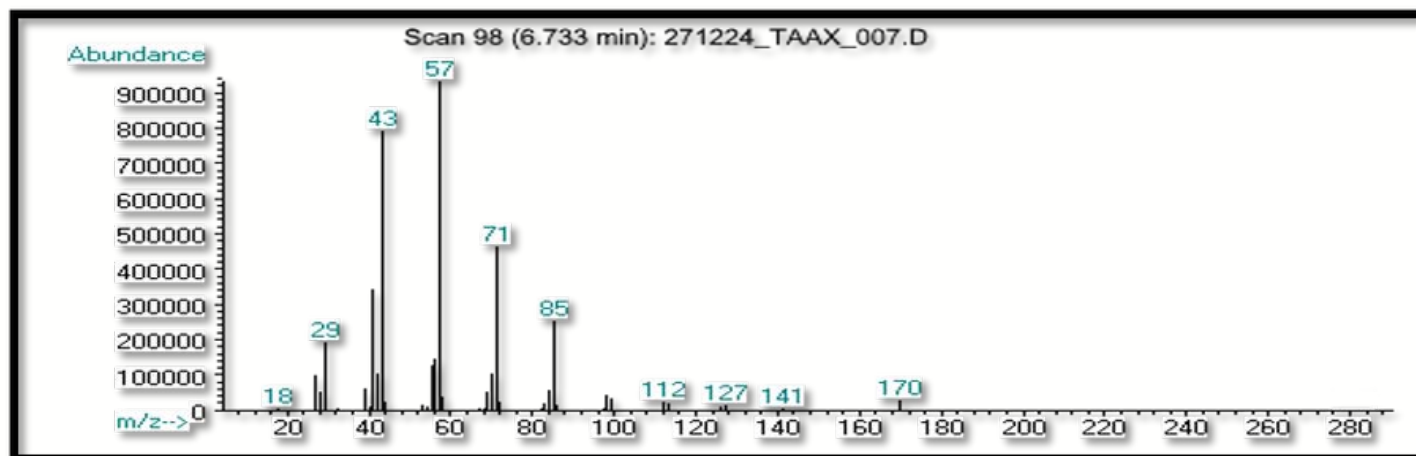


FROM THE TRACES CENTRE

INSTRUMENT FEATURE: GCMS

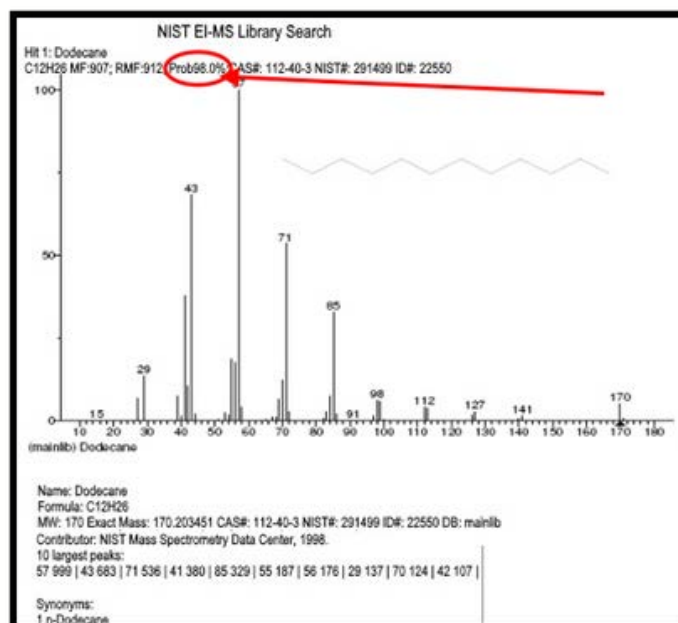
GEI Mass Spectrum

As the individual compounds elute from the GC column, they enter the electron ionization. There, they are bombarded with a stream of high-energy electrons (70 eV) causing the molecules to break apart into fragments. These fragments can vary in size with respect to the original molecule. The fragmentation pattern depends on the molecules mass, formula, bonds, and geometric shape of the analyte of interest. Below the mass spectra of the peak @6.733 minutes.



Compound Confirmation...?

In many cases, care must be taken when confirming the existence/non-existence of a compound. To rely on a single library search may mislead the chromatographer in positively (or incorrectly) identifying a compound. To the right is a typical library search for the above compound. The fact that probability is greater than 90% AND that dodecane was added to the mixture is a reassurance that we have correctly identified the peak @ 6.733 minutes.



FROM THE TRACES CENTRE

INSTRUMENT FEATURE: GCMS

Why GCMS...?

Since scientists Fred McLafferty and Roland Gohlke first demonstrated the combination of gas chromatography (GC) and mass spectrometry (MS) to identify individual substances in a mixture GC-MS remains one of the most powerful, flexible, and widely used tools. GC-MS is used for analyzing chemical mixtures in drug screening, forensic, environmental, and trace analysis, as well as other applications.

Medicine and Pharmaceuticals:

GC-MS is used in monitoring and testing for the detection of several congenital metabolic diseases. It detects trace levels of compounds present in the urine of patients with genetic metabolic disorders. A contaminant of emerging concern (CECs) is pharmaceuticals and personal care products (PPCP). GCMS is at the forefront for detecting the presence of these CECs in ointments, creams, and lotions.



Environmental Monitoring:

Monitoring environmental pollutants is a major application of GC-MS. It is widely used in the detection of dibenzofurans, dioxins, herbicides, sulfur, pesticides, phenols, and chlorophenols and PAHs and VOCs in air, soil, and water.

FROM THE TRACES CENTRE

INSTRUMENT FEATURE: GCMS

Forensic Applications:

Using GC-MS is an integral part of the forensic toxicologist's toolbox. Necessary for several important applications such as blood alcohol concentration, identifying poisons in saliva and drugs of abuse. In the sports world, World Anti-Doping Agency (WADA) tests for performance enhancing drugs such as anabolic steroids in urine and blood.



Food and Fragrance Analysis:

Volatile compounds such as aromatics compounds, fatty acids, esters, aldehydes, alcohols, and terpenes present in food and beverages can be easily analyzed using GC-MS. The technique can also be used to detect spoilage or contamination or adulteration of food. The analysis of a wide range of oils such as lavender oil, olive oil, spearmint oil, and essential oils, alcohols, and syrups is also possible using GC-MS.

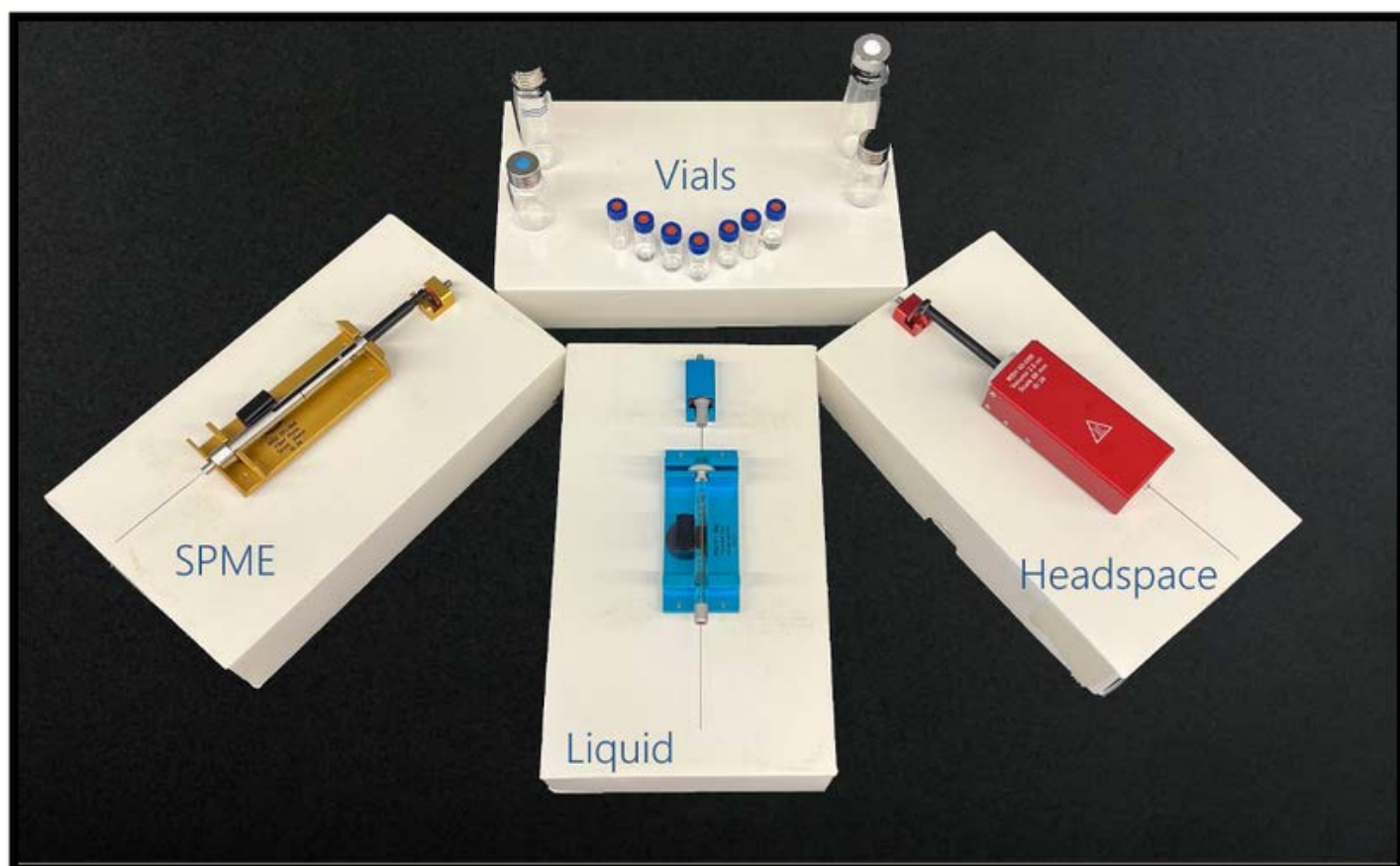
GCMS flexibility

GCMS unlike other techniques is not limited to one sample state (liquid). It can analyze samples in all three states! The TRACES 5975c has the ability to analyze samples in the traditional liquid state as well as solid and gas and all in automation. Gas and liquid and solid samples can be analyzed using headspace analysis technique on the GCMS. Static headspace GCMS is used for the analysis of volatile organic compounds that are either very labile or present in a non-volatile matrix. Typically, Headspace sampling is essentially a separation technique in which volatile material may be extracted from a heavier sample matrix. Another versatile technique is solid phase microextraction (SPME). SPME uses a fiber coated with an extraction phase comprising a pure polymer (liquid coating) or adsorptive particles embedded in a polymer (adsorbent/particle coatings). The fiber coating extracts the compounds from the sample. The SPME fiber is then inserted directly into the GC injector for thermal desorption and analysis. SPME has now overtaken headspace as the technique of choice for samples dealing with food & beverage, flavors and fragrances, forensics and toxicology, and environmental volatiles (VOC).

FROM THE TRACES CENTRE

INSTRUMENT FEATURE: GCMS

Available Injection Samplers:



GCMS limitations

GCMS is limited to analytes that must be volatile and thermally labile but can also withstand the harsh partitioning conditions of the gas chromatograph. Furthermore, as stated above when fragmentation occurs the limit of compound confirmation is limited to the library search results.

Solving GCMS limitations

Please wait for the next exciting issue of the DPES Digest to get more details....

SUMMER ACTIVITIES

OUTDOOR RECREATION

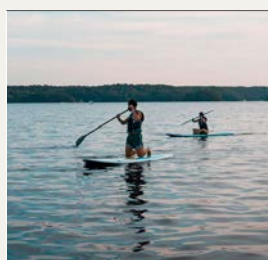
Hey UTSC! Are you looking for fun activities to do in the summer? Well look no further, because the Athletics and Recreation Department has you covered. UTSC Outdoor Recreation is hosting several activities this summer. This is a great way to explore the outdoors, learn about nature, and stay active in the summer!



KAYAKING

Kayak the calm hidden gem of Humber River. An instructor will take you through a paddling orientation and guide your group down Humber River to the mouth of Lake Ontario. All equipment is included & all levels welcome!

Date: Thursday, July 20



STAND-UP PADDLEBOARD

Enjoy sunset guided tours with standup paddleboarding and kayaking along local rivers. All equipment and safety orientations will be provided.

Date: Fri, July 14 or Fri, July 28



SCENIC CAVES

The adventurous hike will take you over southern Ontario's longest suspension bridge, through a labyrinth of caves and crevices and through nature trails with a panoramic view of the surrounding blue mountains.

Date: Friday, August 4

For information about pricing, check out:
<https://www.utsc.utoronto.ca/athletics/outdoor-recreation>

BIKING FOR COMMUNITY

FROM
UTSC SUSTAINABILITY OFFICE

A UNIVERSITY OF TORONTO SCARBOROUGH
HEALTHY CAMPUS
INITIATIVE



Biking for Community is a free bicycle rental service, or "bike share" program, for University of Toronto Scarborough students. Students are able to rent bicycles for one full day and use them for errands or having fun around Scarborough!

The bicycle rental office is located at the Student Residence Centre (SRC) beside Joan Foley Hall and students will need to rent a bike in person by filling out a form and providing their TCard at the SRC.

Check out the Sustainability Office website for more details:
<https://www.utsc.utoronto.ca/sustainability/biking-community>

DPES PROGRAMS SUMMARY

TOTAL PROGRAMS: 17

COOP PROGRAMS: 9

C H E M I S T R Y

Chemistry Specialist
Chemistry Major
Biochemistry Major
Medicinal and Biological Chemistry
Specialist
Environmental Chemistry Specialist
Environmental Chemistry Major

COMBINED DEGREE PROGRAMS: 3

P H Y S I C S A N D A S T R O P H Y S I C S

Physics and Astrophysics Specialist
Physics and Astrophysics Major
Physical and Mathematical Sciences
Specialist
Physical Sciences Major
Environmental Physics Specialist
Minor Program in Astronomy and
Astrophysics

E N V I R O N M E N T A L S C I E N C E

Environmental Biology Specialist
Environmental Geoscience Specialist
Environmental Science Major Environmental
Science Minor
Natural Sciences and Environmental
Management Minor

E N V I R O N M E N T A L S T U D I E S

Environmental Studies Major

C O - O P

Chemistry Specialist - Coop
Chemistry Major - Coop
Biochemistry Major - Coop
Biological Chemistry Specialist – Coop
Environmental Chemistry Specialist – Coop
Environmental Biology Specialist-Coop
Environmental Geoscience Specialist-Coop
Environmental Physics Specialist- Coop
Environmental Science Major-Coop

C O M B I N E D D E G R E E P R O G R A M S

HONOURS BACHELOR OF SCIENCE / MASTER OF ENGINEERING

HONOURS BACHELOR OF SCIENCE / MASTER OF ENVIRONMENTAL SCIENCE

HONOURS BACHELOR OF SCIENCE OR HONOURS BACHELOR OF ARTS / MASTER
OF TEACHING



UNIVERSITY OF
TORONTO
SCARBOROUGH

DPES DIGEST IS LOOKING FOR YOU!

Interested in assisting with the DPES newsletter?
Have any great ideas you want to see come to light?
Send us your resume!

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