
Skulematters

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The paper used is manufactured in North America with 10% post-consumer recycled fibre. The mill has reduced more than 85% of its energy consumption by the use of renewable energy. The small carbon footprint generated by the production of this paper has been counter-balanced by the purchase of ISO 14064-2 verified carbon offset credits.



Skulematters 2018

Alumni Magazine

On the cover
Photography by
Paul Weeks



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How U of T Engineering researchers are ensuring the safety and sustainability of Earth's water



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Your Engineering Alumni Network

Alumni are a vital part of every university community. For more than 100 years, the Engineering Alumni Network (EAN)—formerly Engineering Alumni Association—has maintained a strong bond between Skule™ alumni, students and the Faculty.

The EAN isn't an association you have to join—you, and nearly 50,000 of your fellow U of T Engineering graduates, already belong to this incredible community of peers. We want to encourage you to engage with your EAN community and to take advantage of its many benefits.

If you have not already done so, please participate in the EAN community through U of T Engineering CONNECT (uoftengineeringconnect.ca), which will provide you with a positive engagement experience well into the future.

The EAN and our U of T Engineering CONNECT platform are great resources for advancing careers, discovering volunteer and mentorship opportunities, reconnecting with the Faculty and alumni, and keeping you updated on reunions and events.

We want you to know that the EAN will always be a part of your journey—wherever engineering may take you.

Teo Dechev (GeoE 9T6)
President,
EAN Executive Board

A Message from Dean Cristina Amon



IT IS MY PRIVILEGE to present your 2018 edition of *Skulematters*, the alumni magazine of the Faculty of Applied Science & Engineering. This year's issue presents some of our world-leading research, spanning stormwater, fresh water, drinking water and industrial water.

Water unites us—from our kitchen faucets to the largest ocean, all water on Earth is part of the same global cycle. Ensuring the safety and sustainability of this vital resource is an important challenge for every society, regardless of income or geographical location, and our vibrant U of T Engineering community is creating innovative technologies to do so.

Through our Institute for Water Innovation (IWI), one of more than 25 research centres and institutes in our Faculty, we are bringing together industry, government, academia and other partners to translate creative research from the lab to the marketplace. Such multi-disciplinary research collaborations are improving lives here in Canada and in many other parts of the world.

This work will be further catalyzed by the Myhal Centre for Engineering Innovation & Entrepreneurship, our Faculty's newest building, set to open on April 27, 2018. The Myhal Centre will provide a new home for IWI and several other Faculty-wide initiatives, including The Entrepreneurship Hatchery and the Centre for Global Engineering. It will set a new standard for engineering

education and experiential learning, with flexible, technology-enabled classrooms, prototyping facilities and dedicated space for student clubs, teams and co-curricular activities.

The past year in the life of our Faculty has been filled with remarkable accomplishments, some of which are highlighted in this issue. Our U of T Engineering community now includes Canada's Governor General, **Julie Payette** (ECE MASc 9T0), and Ontario's first Chief Scientist, Professor **Molly Shoichet** (ChemE, IBBME). In fall 2017, the proportion of women in our incoming undergraduate class reached 40.6 per cent, its highest level yet, and one in four of our incoming students are international. In just a few short years, this diverse and talented cohort will join you in our global alumni network.

The stories featured in this issue highlight some of the many reasons we can all feel a deep sense of pride in our accomplishments as an engineering community. Together with you, our esteemed alumni, we are nurturing the next generation of global engineering leaders and innovators who are addressing some of the most critical challenges of our time.

Cristina Amon
Dean



Rayla Myhal, Dean Cristina Amon and George Myhal (IndE 7T8).

THANK YOU GEORGE & RAYLA MYHAL

WE ARE GRATEFUL TO THESE DEAR FRIENDS,
FOR THEIR GENEROSITY AND STEADFAST COMMITMENT

Our Faculty is immensely proud that our newest building will bear their name

The Myhal Centre for Engineering Innovation & Entrepreneurship, opening April 2018, ushers in a new era of engineering education and research. Home to world-leading collaborative research centres and institutes, the Myhal Centre will foster enhanced research collaboration and creativity among our students, faculty, staff, alumni and industry partners.

Every element of the building is designed to enhance experiential learning for our students.

It will accelerate the thriving culture of innovation and engineering entrepreneurship at the University of Toronto and enable the prosperity of our city, our province and our country.



BOUNDLESS

Skule™ Impact

Innovations and events that position Skule™ alumni, researchers and students as global engineering leaders.



Arrowonics CEO Everett Findlay (holding drone) and founder Hugh Liu participate in a test flight at UTIAS. In 2016, the startup conducted Canada's first-ever Transport Canada-approved multi-drone performance in front of an audience.

SYNCHRONIZED FLIGHT TECHNOLOGY BRINGS DRONE BALLETS TO THE NIGHT SKY

University of Toronto Institute for Aerospace Studies (UTIAS) spinoff Arrowonics is commercializing patented technology that enables a swarm of drones to sense each other's location and fly as a coherent unit. In the future, drone swarms like these could be used to carry pieces of a deliverable package to remote locations, or host a suite of sensors to track natural events such as forest fires. For now, Arrowonics' fleet is performing dazzling light shows. In the past year, they have performed across Canada as well as at the Four Seasons Hotel at Burj Alshaya in Kuwait City.

Founded by Professor **Hugh Liu** (UTIAS) and former graduate students **Everett Findlay** (UTIAS MSc 1T1), **Mingfeng Zhang** (UTIAS PhD 1T3) and **Henry Zhu** (UTIAS MSc 1T4), Arrowonics is lighting up the sky with text, logos and animations for a variety of occasions. "Thanks to a combination of technology, timing and demand, I think we're seeing the beginning of a golden age in the development of unmanned aerial vehicles," Liu says. ☑ arrowonics.com

BY ROGER FIGUEROA

INTELLIGENT TREMOR CONTROL

Troubled by his grandmother’s struggles to drink coffee without spilling it, alumnus **Mark Elias** (CivE 1T4) set out to create a solution. He co-founded Steadiwear and developed the Steadiglove, a specially designed glove that stabilizes the hands of patients with Parkinson’s disease or essential tremor. Elias started by investigating the tuned dampening systems used to make buildings more earthquake resistant. The final product employs a ball joint surrounded by a non-Newtonian fluid—one whose viscosity varies depending on the force applied, like that of a cornstarch and water mixture. The resulting device, developed with co-founder Emile Maamary at U of T’s Impact Centre accelerator, allows patients to move their hands voluntarily and stiffens up when it encounters the quick, jerky movements associated with tremors.

steadiglove.com



↑ The Steadiglove is a stark contrast to existing tremor treatments that either rely on powerful drugs or weighted gloves to impede voluntary movement.



↑ “Our vision is to provide ubiquitous connectivity to gather the world’s information,” says Mina Mitry (EngSci 1T2, UTIAS MASc 1T4), Kepler co-founder and CEO.

↙ The rocket bearing Kepler’s satellite, Long March 11, launched on Jan. 19, 2018 at 12:11 p.m. (BST), marking the 100th successful launch from Jiuquan Satellite Launch Center in China.

SATELLITES THE SIZE OF A LOAF OF BREAD

An award-winning team of U of T Engineering alumni is building compact satellites through startup Kepler Communications. They plan to place 140 of these low-cost “cubesats” into space over the next five years. Kepler’s orbiting system will act as a “cellular network in space,” facilitating communication between other satellites and ground stations. This network could make air travel safer, enable instant detection of leaks in remote oil pipelines, help improve crop yields and monitor the heart rates of remote first responders. Working with U of T’s startup incubators The Entrepreneurship Hatchery and Start@UTIAS, Kepler has secured more than US\$5 million in funding to develop its technology and bring its first cubesats to market. keplercommunications.com

TOP: COURTESY STEADIWEAR BOTTOM: COURTESY KEPLER COMMUNICATIONS

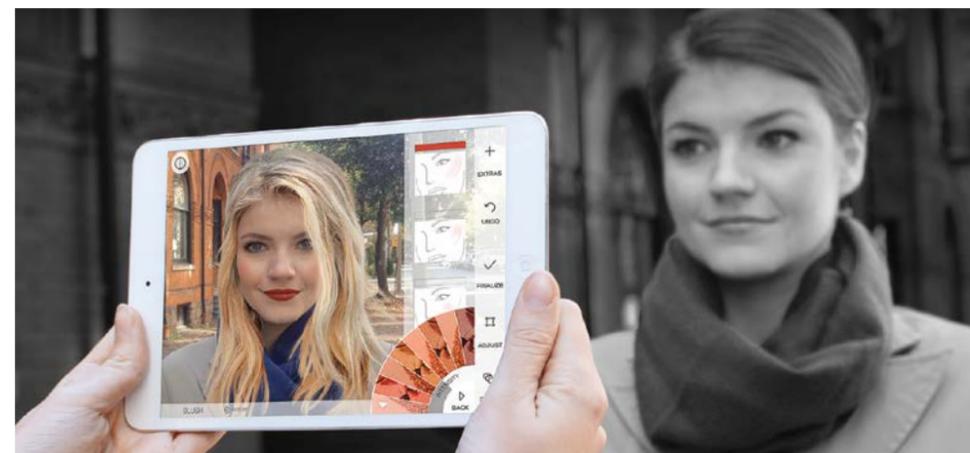


↙ “Ask anyone in Toronto’s tech scene and they’ll tell you: Serbinis is Toronto’s best hope at creating the next Google, Uber or Shopify.” —Toronto Life

A LEAGUE OF ITS OWN

Alumnus **Michael Serbinis** (IndE MASc 0T0), the founder of Kobo, has returned to the startup game with League—a company he launched in 2015 to disrupt the health insurance industry. League is a new digital alternative to traditional health insurance that connects employers and employees to a comprehensive network of health services and benefits. In 2016, the company raised US\$33 million in financing, led by OMERS Ventures, and has since partnered with RBC Insurance to offer a full suite of insurance products through its licensed subsidiary, League Insurance Agency Inc. Serbinis was featured in *Toronto Life*’s list of the 50 most influential people of 2017. He has a goal to build League into a billion-dollar company in 2018. league.com

REAL-TIME BEAUTY SOFTWARE



↑ Try it yourself! Download the ModiFace Live app from the App Store or Google Play.

Have you ever wondered what you’d look like with a different hair colour or shade of makeup but were afraid to commit? ModiFace lets you find out instantly. Founded by Professor **Parham Aarabi** (ECE), ModiFace uses augmented reality and artificial intelligence to build advanced facial visualization software for the beauty and medical industries. The technology lets users virtually manipulate their

appearance, trying on makeup products and hair styles in 3D and real time. ModiFace powers over 100 augmented reality applications by Fortune 500 brands including Sephora, L’Oréal, Allergan, Vichy and Clairol. Last spring, the company invested \$4 million to create new undergraduate and graduate student internships, and to support leading research at U of T Engineering. modiface.com

TOP: COURTESY LEAGUE BOTTOM: COURTESY MODIFACE

DID YOU KNOW?

U of T Engineering’s revolutionary inventors and entrepreneurs include:



First car radio for General Motors Canada
Frank Henry
Ralph Pounsett,
ElecE 2T8



Alkaline battery
Lewis Urry
ChemE 5T0



IMAX projection system
William Shaw
MechE 5T1



CyberFone: The first smartphone
Rocco Martino
UTIAS PhD 5T6



Instant Pot pressure cooker
Dongjun Wang
ElecE 9T5

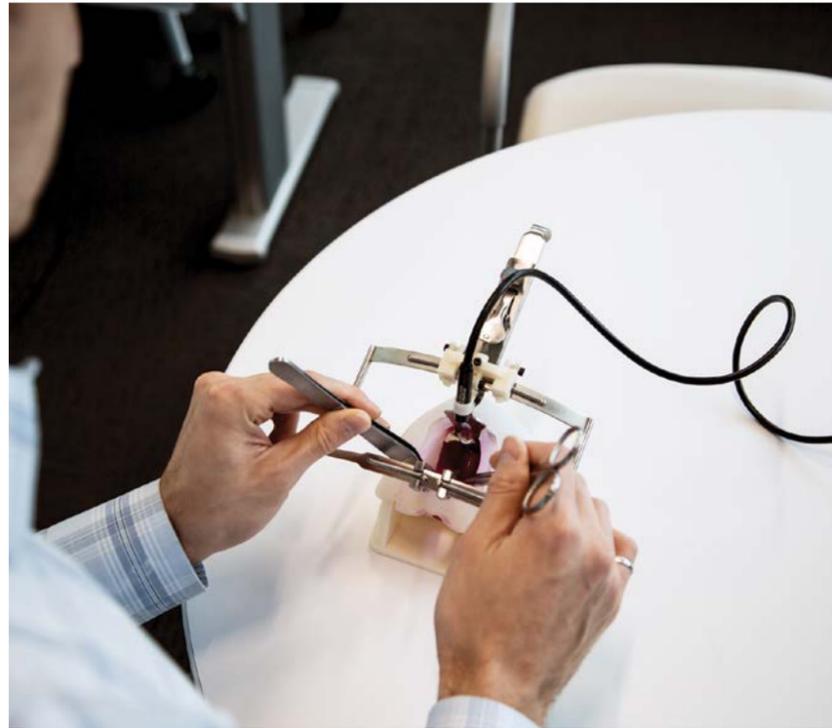


Nanoleaf: the world’s most energy-efficient LED bulb
Gimmy Chu
ElecE 0T6
Tom Rodinger
IBBME PhD 0T7
Christian Yan
ElecE 0T6

CLEFT PALATE SIMULATOR FOR SMOOTH SURGERY

Between 400 and 500 babies are born with a cleft palate each year in Canada. This potentially serious birth defect can lead to ear infections and difficulty feeding and speaking. While corrective surgery is straightforward and effective, the small confines of a baby's mouth and the delicate tissues involved make it uniquely challenging. New simulation equipment developed by **Dale Podolsky** (IBBME PhD 1T7) allow doctors to gain mock surgical experience before performing procedures on tiny patients. His company, Simulare Medical, is helping to accelerate the development of robotic instruments for surgery with a cleft palate surgical simulator. simularemedical.com

↳ The cleft palate simulator is created using 3D printing, adhesive and polymer techniques to provide the most realistic simulation environment possible.



FROM CHEMICAL ENGINEERING TO CRAFT BEER

Mohan Pandit, Matthew Reiner and Chris Ristevski (all ChemE 1T0) met on the first day of class at U of T Engineering in 2006. After years of home-brewing experience, and exploring countless craft breweries and beer gardens around the world, the trio of friends opened Rorschach Brewing Company together in the Leslieville neighbourhood of Toronto.

Named after the Rorschach ink blot test, the brewery focuses on farmhouse-style ales, barrel-aged beers and sours. Pandit and Reiner returned to their alma mater last summer with Rorschach for the Hart House Craft Beer Festival. rorschachbrewing.com

↳ Matthew Reiner (left) and Mohan Pandit (right) said that their engineering education was "the foundation for understanding everything about starting a brewery."



↳ The final TeleHex product (pictured) was the result of more than 1,000 hours developing prototypes, says founder Peter Wen.

TELEHEX: A CYCLIST'S DREAM TOOL

Peter Wen (Year 4 MechE) has been a serious cyclist for many years. His company, TeleHex, aims to make bike repair easier—not just for pros like himself, but for newbies, too. Wen's multipurpose hex-key tool, designed and launched through The Entrepreneurship Hatchery, automatically adjusts to fit the metric bolt sockets on most bikes. The device is half the weight and volume of products currently on the market. telehex.myshopify.com

TOP: BY DAN HAVES MIDDLE: BY ROMI LEVINE

AN INCUBATOR FOR THE NEXT GENERATION OF ENGINEERING ENTREPRENEURS

The Entrepreneurship Hatchery is a unique part of Canada's vibrant entrepreneurship ecosystem, and will soon have a home in the Myhal Centre for Engineering Innovation & Entrepreneurship. It combines experienced mentors, engaging programming and access to resources to create an environment where innovative and dynamic student startups thrive. This is where students can experience the successes and challenges of the entrepreneurial enterprise.

Championed by some of Canada's foremost innovators and business professionals, the Hatchery creates countless opportunities for the next generation of entrepreneurs.

hatchery.engineering.utoronto.ca



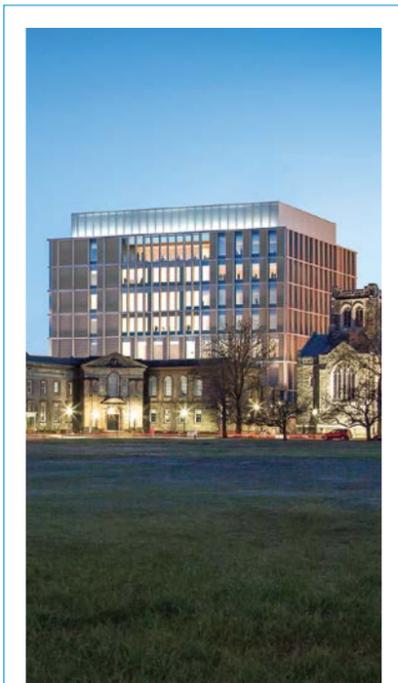
↑ An architectural rendering of The Entrepreneurship Hatchery's new home on the fifth floor of the Myhal Centre. The fifth floor will also house two of the Faculty's leading multi-disciplinary design and robotics labs. RENDERINGS COURTESY MONTGOMERY SISAM ARCHITECTS

HATCHERY NEST

This rigorous summer program offers undergraduate and graduate student teams the structure to develop their entrepreneurial ideas and participate in practice pitch events. Students gain access to funds, fabrication facilities, space and mentorship. Since its establishment in 2012, more than 1,000 students have applied and over 200 teams have participated in the program. Hatchery Nest has launched more than 55 startups in the past five years.

HATCHERY LAUNCH LAB

The newest Hatchery initiative gives U of T Engineering graduate students, postdoctoral fellows and faculty members the support they need to take startups to the next level. It enables teams that have already completed significant technological development the ability to sustain themselves for one or two years while they "de-risk" their technology, define a viable business model, attract investors and prepare for growth.



MYHAL CENTRE FOR ENGINEERING INNOVATION & ENTREPRENEURSHIP

A bold commitment to engineering innovation, where multidisciplinary collaboration and experiential learning will flourish. It's home to The Entrepreneurship Hatchery, which will provide the space, equipment and support for bringing student ventures and research spinoffs from concept to prototype and beyond.

On-site fabrication and prototyping facilities will enable student entrepreneurs to develop, iterate and execute on their bold business ideas. The Hatchery space is designed for seamless transition between ideation and fabrication.

Adjacent to the Hatchery, a versatile space will allow student startup teams to collaborate with alumni, mentors, advisors and investors.

Learn more at uoft.me/myhalcentre.

FOUR STUDENT STARTUPS TO WATCH FROM U OF T ENGINEERING'S HATCHERY DEMO DAY



Team Genecis (left to right): Marcos Ingreja, Walter Pawliw, Bowen Li (ChemE 1T7), Hasitha de Alwis, Robert Fairley (Year 3 ECE), Luna Yu and Kaitlyn Chow.

Genecis
Turning your leftovers into biodegradable plastics

For every 30 pounds of leftover food, Genecis will be able to create a pound of biodegradable plastic. The U of T student startup uses two different cultures of microorganisms to transform table scraps into plastic granules. The resulting biodegradable plastic is ideal for making thin-film packaging and water bottles, says founder and CEO Luna Yu. The team's ingenious solution earned them the top prize at the 2017 Hatchery Demo Day. genecis.co



Team Xpan (left to right): Zaid Atto (EngSci 1T6 + PEY), Seray Cicek (EngSci 1T6 + PEY) and Chevis Dilbert (MechE 1T6 + PEY).

Xpan
Expanding keyhole surgery

Laparoscopic surgery—sometimes known as keyhole surgery—can be an attractive option for patients: smaller incisions may reduce both pain and healing time. In this type of surgery, instruments and cameras are inserted into the body through a device known as a trocar. Team Xpan set out to improve the trocar. What began as a class project for a biomedical systems engineering design course evolved into their expandable trocar, for which they have filed a provisional patent.



Left to right: Lakshmy Subramanian and Rachel Baker (IndE 1T7 + PEY) are the co-founders of Tejo.

Tejo
A better way to buy makeup

Many people feel the North American makeup industry does a poor job of serving those with darker skin tones. Tejo, an online makeup service, believes that artificial intelligence and machine learning offer a solution. Users simply take a selfie, which is then fed into Tejo's software. Using open-source computer vision and a proprietary algorithm that accounts for ambient lighting conditions, Tejo determines a user's precise skin tone and recommends an appropriate brand of makeup. If the user chooses to buy the product, Tejo collects a five- to 10-per cent commission. tejo.ca



Aakash Goel (EngSci 1T6 + PEY) is the founder of enginehire.

enginehire
A smarter career matchmaker

Enginehire leverages data to connect new engineering graduates with employers looking for talent. Prospective candidates create a profile that places equal emphasis on their experience and their passions, whether they are interested in structural design, green infrastructure, acoustics or machine learning. Proprietary algorithms then slice through this rich database, delivering companies five to 10 ideal candidates for a given position. Enginehire has built a database of thousands of graduates and has already made successful candidate-employer matches. enginehire.me

Skule™
in Photos



1



2



3



4



5



6

NOVEMBER 2, 2017
ENGINEERING
ALUMNI NETWORK
AWARDS DINNER

- 1 Engineering Alumni Network Hall of Distinction inductee **Kathy Milsom** (CivE 8T3) with Professor **Brenda McCabe** (CivE).
- 2 Professor **Christopher Damaren**, Director of the University of Toronto Institute for Aerospace Studies, with Engineering Alumni Network Hall of Distinction inductees **Rocco Martino** (UTIAS PhD 5T6) and **Tom Siddon** (UTIAS MSc 6T6, PhD 6T9).
- 3 Engineering Alumni Network Executive Board members **Isi Caulder** (EngSci 8T9, ECE MSc 9T1) and **Paul Graham** (MechE 0T2 + PEY).

JUNE 3, 2017
SPRING REUNION

- 4 Dean **Cristina Amon** with 50-year medal recipient **Bill Troost** (ChemE 6T7).
- 5 Alumni from the Class of 1T2 have some photo booth fun during Spring Reunion.
- 6 Jean and Lauri **Hiivala** (ElecE 6T5) take a tour of the Myhal Centre for Engineering Innovation & Entrepreneurship.

PHOTOS 1-3: MICHAEL TENAGLIA PHOTOS 4 & 6: KENDALL TOWNEND

CONTINUED →

OCTOBER 5, 2017
BIZSKULE: FROM STARTUP TO SUCCESS STORY—HOW TO BE AN ENGINEERING ENTREPRENEUR

1 Panellist **George Babu** (EngSci 0T0).



2 Panellists **Natasha Baker** (ElecE 0T8) and **Mike Montano** (ElecE 0T8).



APRIL 19, 2017
BIZSKULE: FROM BIG DATA TO DEEP LEARNING—HOW BUSINESS IS EMBRACING ARTIFICIAL INTELLIGENCE

3 Left to right: **Vesna Gmazel** (ChemE 8T9, MEng 9T6), **Dean Cristina Amon** and **Indi Gopinathan** (MinE 9T6).



4 Panellist **Gary Saarevirta** (EngSci 8T8).



5 Alumna **Kristy Duncan** (IndE 8T3) with **Claire Kennedy** (ChemE 8T9), chair of the BizSkule Executive Committee and chair of University of Toronto Governing Council.



PHOTOS 1-2: BY DOUGLAS FAIRBAIN PHOTO 3-5: BY DAN GALBRAITH

NOVEMBER 24, 2016
BIZSKULE: FINTECH—(DON'T) SHOW ME THE MONEY

6 Left to right: **Imad Ferzli** (ECE MAsc 0T3, PhD 0T9), **Alvin Mok** (EngSci 0T3), **Frank Palmay** (EngSci 7T2), Professor Emeritus **Joe Paradi** (MIE) and **Dan Rosen** (ChemE MAsc 9T1, PhD 9T3).



FEBRUARY 23, 2017
BIZSKULE: IS BLUE THE NEW GREEN AND THE NEW GOLD? THE BUSINESS OF INDUSTRIAL WATER

7 **Sandra Odendahl** (ChemE MAsc 9T0) serves as moderator.

NOVEMBER 22, 2017
CEIE NATIONAL CAKE DAY CELEBRATION

8 Left to right: EngSoc president **Jonathan Swyers** (Year 4 CompE) and professors **Aimy Bazylak** (MIE), **Goldie Nejat** (MIE) and **Jonathan Rose** (ECE) make the ceremonial first cut into a giant Myhal Centre cake, which was designed to celebrate National Cake Day.



MARCH 23, 2017
TRACKONE 10-YEAR ANNIVERSARY REUNION

9 **Alfred Huynh** (ChemE 1T2 + PEY) and **Tabish Gilani** (MechE 1T7).



SEPTEMBER 20, 2017
AJAX REMEMBERED: CELEBRATING THE LEGACY OF U OF T ENGINEERING'S POSTWAR SATELLITE CAMPUS

10 Alumnus **Don King** (ChemE 5T0) speaks to alumni, students, staff and faculty about his years at U of T Engineering's Ajax satellite campus.

PHOTOS 6-7: BRIAN SULLIVAN PHOTO 9: ALAN YUSHENG WU

HAVE YOU ACCEPTED THE SKULE™ REUNION GIVING CHALLENGE?

U of T Engineering challenges all alumni from graduating classes ending in 3 or 8 to make a gift in celebration of their reunion.

It's not about dollars raised —
it's about class participation!

Whether you give \$20.18 or \$2,018, every gift makes a direct impact on our ability to award student scholarships, support student clubs, and provide unparalleled leadership and career service programs to our students.

Our goal is to reach an alumni participation rate of just 5%.

Classes with the highest participation rate will receive special edition Skule™ patches—and bragging rights until the next Alumni Reunion!

SAVE THE DATE FOR ALUMNI REUNION

May 30 – June 3, 2018

Alumni Reunion offers a special opportunity to reconnect with classmates and rediscover U of T Engineering. Official registration materials will be sent out soon. We look forward to seeing you on campus!

FIND OUT MORE:

www.uoft.me/SkuleReunion2018



by Tyler Irving photography by Paul Weeks

A Way with Water

U of T Engineering researchers ensuring a safe and sustainable global resource

Stormwater, fresh water, drinking water, industrial water: all water on Earth is part of the same cycle—and every drop matters. Around the world, water supply and quality are under increasing pressure from population growth, industrial development and climate change.

U of T Engineering researchers are leading the way in addressing these pressing global challenges. We are developing new techniques for preventing urban floods and removing contamination. We are also ensuring that drinking water and sanitation processes remain safe and cost-effective where they exist, and addressing barriers where they do not.

Through multidisciplinary research and industrial partnerships, our faculty members and students are creating solutions that will enhance our water cycle for generations to come.



Professor **Jennifer Drake** studies the effectiveness of infrastructure—including this green roof—that is designed to provide a more natural flow of rainwater back into lakes, rivers and groundwater reservoirs.

IT STARTS WITH JUST A FEW DROPS. After a minute or two it becomes a light mist, then a steady rain, then a torrent. A storm over a city the size of Toronto can empty enough water to fill more than 10,000 Olympic-sized swimming pools in less than a day.

All this water needs somewhere to go, but as most city surfaces are covered in water-impermeable concrete or asphalt, low-lying areas can flood. As the water washes over streets and sidewalks, it picks up trash, dirt, oil and chemical contaminants. The surge can quickly overwhelm the city's wastewater treatment plants, dumping millions of litres of untreated water into Lake Ontario.

Professor **Jennifer Drake** (CivE) believes there is a solution. Her research group studies green infrastructure that restores a more natural flow pattern to our built environment. These include green roofs, which can soak up water that would otherwise flood eavestroughs, as well as permeable pavement that lets floodwaters slowly infiltrate into the soil.

Drake and her team are especially interested in the long-term performance of these technologies. "Often when people build a green infrastructure system, there is a big congratulatory party, and then everyone walks away," she says. "We want to measure whether or not it's still working two, five or 10 years later."



The impact of climate change is evident in water: too much, not enough, not there when we need it. We need to prepare differently for events like droughts and floods, which we can't predict as well as we used to. Scientists and engineers need to communicate clearly about these issues with policy makers and citizens so we all understand the challenges and measures necessary to address them.

Sandra Odendahl (ChemE MASc 9T0), president and CEO of CMC Research Institutes, is an environmental sustainability and innovation leader who currently works with government and commercial stakeholders to demonstrate and scale up environmental technologies that address climate change.

According to Drake, many of Toronto's green roofs are irrigated with city drinking water. This keeps them looking nice and green, but it's completely counter to the goal of buffering stormwater flows. For U of T's newest green roof, situated atop the John H. Daniels Faculty of Architecture, Landscape and Design's building at One Spadina, Drake and her collaborators are trying a different approach.

"One of the things that we're investigating is the use of recycled stormwater for irrigation," she says. "The water that discharges from the building's green roofs will be collected in a cistern, and then returned to the green roof for irrigation."

Other solutions they are studying include bioretention cells, also known as rain gardens. Constructed with engineered soil, these structures allow water to infiltrate into the ground while removing contaminants. Rain gardens can be added to public parks and individual homes, with the positive impact multiplying across the entire city.

"What I find so interesting about the whole stormwater world is that on the surface you think that the solution should be really simple, but the human element makes it really complicated," she says. "Our expectations about how infrastructure should look, how much space it should take up, and the services we expect from it mean that we really need to be creative about our solutions."



From changing precipitation levels and patterns, to a water level drop in the Great Lakes Basin resulting in greater concentration of natural-occurring bacteria, there are many priorities for us to address. Innovations like those being developed by U of T's Drinking Water Research Group are already being considered.

Liza Ballantyne (CivE MASc 9T9), senior engineer at the City of Toronto, is charged with ensuring the safety of residents' drinking water.

GREEN INFRASTRUCTURE CAN help ensure that the water flowing across the city into lakes and rivers is less polluted than today. In the meantime, millions of people rely on those same bodies of water for drinking, cooking, washing, transportation and more. Safeguarding the water that comes out of your tap is the mission of the Drinking Water Research Group (DWRG).

Led by civil engineering professors **Bob Andrews, Susan Andrews and Ron Hofmann**, the DWRG maintains strong partnerships with manufacturers of water treatment equipment, such as General Electric Water & Process Technologies, as well as the City of Toronto and a number of other municipalities in and around the GTA.

"We look at what the emerging issues are, what's going to be important five to ten years from now," Hofmann says. "If someone identifies a new contaminant that might be regulated in the future, we say: here's what you can start doing now."

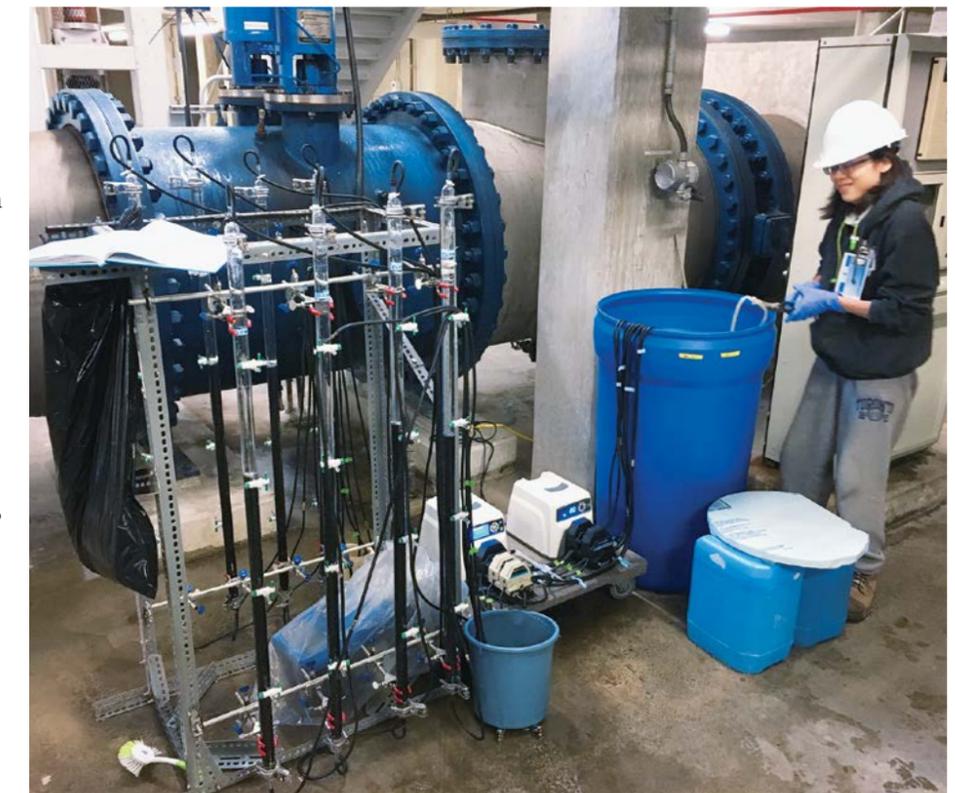
For example, most of the drugs we take—from antidepressants to birth control—pass through our bodies into wastewater. Current treatment cannot remove drug molecules, and environmental scientists are increasingly finding them downstream of urban areas. Though their concentrations in source water are still very low, regulations may soon require drinking water treatment plants to remove these molecules as part of their standard performance.

Hofmann and his collaborators are investigating the use of ultraviolet (UV) light as one solution. This kind of treatment is already used by some municipalities to disinfect drinking water, removing bacteria and other disease-causing organisms.

"To destroy these [pharmaceutical] chemicals, you have to use much higher UV doses than you would to kill microorganisms alone," Hofmann says. "You destroy the chemicals, which is good, but you may be forming some byproducts that are also toxic. We look for those hidden dangers so municipalities can make informed decisions about new approaches."

Another significant aspect of DWRG's work involves testing new pieces of process equipment for municipalities. Bob Andrews recently collaborated with John Thompson, director of environmental services with the City of Barrie, to study the effectiveness of granular activated carbon beds, a type of biological filter used to remove compounds that can affect the taste and odour of drinking water.

Although the manufacturer suggests a replacement every five years, the analysis showed the beds remained effective for more than 10. The result: savings of more than \$1 million over a decade. "As water managers, most of our time is taken up with the day-to-day provision of safe drinking water," Thompson says. "This partnership gives us access to research and current knowledge, and can help us leverage the resources we have."



Zhjie Nie (CivE MASc candidate) takes a sample at a Toronto-area drinking water treatment plant. The Drinking Water Research Group maintains strong partnerships with industry and government, enabling students to gain valuable experience in a professional setting.

PHOTO BY RON HOFMANN



Anna Jiang (MIE MASc candidate) demonstrates her passive water controller for community members in Pedro Arauz, Nicaragua. The device is designed to help farmers make more efficient use of irrigation water.

WHILE UV TREATMENT and granular-activated carbon beds may be effective options for Canadian municipalities, these technologies are out of reach for many areas of the world. Professor **Amy Bilton** (MIE) is the associate director of the Centre for Global Engineering and runs U of T Engineering's Water and Energy Research Lab, which aims to develop locally appropriate solutions.

In Pedro Arauz, Nicaragua, a harsh dry season takes over for half of the year. Rivers evaporate, and crops and livestock

can be devastated by the lack of water. While the area has plenty of ground-water and dug wells, the use of pumps and sustainable irrigation is limited by a lack of infrastructure, high costs and difficulties importing goods.

By contrast, wind pumps can be built and maintained using local materials. In 2014 two Canadians, engineer John Shoust and management consultant Rob Scott, founded the Winds of Change initiative and began searching for a team of engineers who could take on the

challenge and design a solution for the people of Pedro Arauz.

Bilton brought the project to her fourth-year capstone design course, and was inundated with applications from students who wanted to participate. Over the course of the next two years, several teams collaborated on a design that was both powerful enough to pump the required volume of water, yet simple enough to be built and repaired with locally available materials.

In January 2016, Bilton and five students worked with community members to build the wind pump out of wire, sheet metal and PVC piping in just four and a half days. "It pumped water for the first time just before we headed home, so students were really excited about that," Bilton says.

Since then, students have continued to work with the community to improve the wind pump and implement sustainable irrigation systems to make best use of the water. **Anna Jiang** (MIE MASc candidate), one of Bilton's graduate students, discovered that inefficient watering practices in the community were resulting in poor yields and water waste. To address these challenges, she developed a passive irrigation controller, a device capable of sensing how much water the soil requires and regulating the flow accordingly, all without electricity.

"I wanted to apply my engineering skills to real-life challenges that could help create global equality," Jiang says. "Using smart scheduling to save water could help in an area like Pedro Arauz, but many of the farmers haven't used irrigation before. This controller takes a lot of the guesswork out of the equation."

Bilton says there is still a long way to go before the water controller can be deployed, but it has potential. "Right now, we are developing models to really understand what's going on and then validating them experimentally," she says. "We'll then use these to optimize the design for particular crops and evaluate the impact of the device on crop yields and water usage. We'll be doing consultation with the community throughout the process."

COURTESY OF ANNA JIANG

AS A MAJOR GLOBAL PLAYER in the mining industry, Canada can have a significant impact on the way the water used in mining is managed.

"Mining uses a tremendous amount of water," says Professor **Lesley Warren** (CivE), director of the Lassonde Institute of Mining at U of T Engineering. Water is needed for processes such as flotation, which enables the separation of high-value minerals from low-value ones, and for the extraction of bitumen from oil sands. While mines recycle as much water as they can, they produce large volumes of tailings, a waste slurry made up of post-extraction, ground-up rock, chemicals and impacted water. These tailings are commonly held in on-site ponds where they have to be managed and treated.

Bacteria and other microorganisms live in tailings ponds and thrive on mineral wastes; indeed some actually 'breathe' rocks. However, these bacterially-driven chemical reactions can lead to environmental impacts such as acidification, toxicity and oxygen consumption. Currently, it is difficult for mines across all extractive resource industries to ensure that no impacts

ever occur from their tailings ponds to the local environment because they don't fully understand these processes.

"Mining companies know that microorganisms are driving these reactions, but it's still a black box," says Warren, who also holds the Claudette MacKay-Lassonde Chair in Mineral Engineering. "The lack of available technologies has meant that there has been little research to determine which bacteria are doing what, which ones could serve as early warning signals, or those that could actually be used as the biological treatment itself. Most importantly, mining companies don't know which levers to pull to control the system."

By studying the genes and behaviour of these organisms in the lab, Warren and her collaborators are working to identify interventions that could prevent negative reactions and promote positive ones. This work involves experts in geochemistry, microbiology and genomics from Canada, the U.S. and Australia, three mining companies, and two engineering consulting firms.

"Once we understand the microbes and how they affect wastewater geochemistry, we can pinpoint the drivers of their behaviour," Warren says. "Which wastewater compounds are they using? Do they like it hot? Do they like it cold? We can adjust those drivers to design new processes that do what we want them to do, using the bacteria that are already in these systems."

Warren, who jokes that she has always preferred dirty water to clean, believes that recent advances in microbial genomics and other techniques have opened up many new possibilities in the field.

"So many of the organisms we're finding are new to science," she says. "The chances that we are going to find organisms that are capable of doing creative things that could be useful are very high." ☐

Lesley Warren (left) and her team take water samples at a site in Northern Ontario. By studying the microbes present in industrial process water—including their genomes—they aim to develop new strategies for preventing and managing pollution.



COURTESY OF LESLEY WARREN



Increased emphasis on continuous remote monitoring of tailings impoundment areas can allow a range of conditions to be identified and managed before they become a problem. Researchers from U of T and across the country are collaborating to drive this technology forward as part of the Canadian Mining Innovation Council's 10-year Towards Zero Waste Mining program.

Chris Twigge-Molecey (MIE MASc 6T9, PhD 7T2) is a senior advisor at Hatch and past member of the Canada Mining Innovation Council board. Read more about his involvement with U of T Engineering on page 20.

#EVERY DROP MATTERS

DID YOU KNOW?

The United Nations predicts global water demand will increase 55% by 2050. If current trends continue, the world will only have 60% of the water it needs in 2030.

Test your water knowledge. Take our quiz at uoft.me/waterresearch.

What sparks a desire to give back to Skule™? For many alumni, it's an inspiring professor, or innovative research happening in an area of personal interest. It can also be a sense of gratitude for the impact U of T Engineering has had on their lives and careers.

Many contribute their time as well, sharing their knowledge and inspiration with students.

Skule™ alumni serve on boards and committees, mentor aspiring entrepreneurs, judge student competitions and form research partnerships. They are the spirit of the Faculty, supporting our vision and our research, and encouraging future generations of engineers.

Why I Give

Story by **Emily Meyertholen**
Illustration by **Scott Waters**



I want to reinforce the idea that U of T Engineering graduates are capable of bringing cutting-edge innovation to the market, and they can do that right here.

Avanindra "Av" Utukuri (EngSci 9T6)
Chief Technology Officer, Baanto



To nurture homegrown talent

As a serial entrepreneur over the last 20 years, Avanindra "Av" Utukuri has watched many promising young engineers take their talents elsewhere. "The reality is, we are not great at keeping innovation in Canada and there are many opportunities to help create a new ecosystem," he says.

His efforts to change this include briefing the EngSci Board of Advisors on its initiatives and becoming a U of T Engineering instructor himself. "I was given the opportunity to rethink the fourth-year EngSci ECE capstone course as a 'startup 101,'" he says. "It gives students the experience of trying to design a new product and prompts them to think through the various problems that they would have to solve. The ultimate goal is to help them realize they can really do this."

Utukuri's own first startup was born out of his second-year EngSci design course. Dynamic Visions Ltd. developed virtual reality simulation systems and arcade entertainment systems. It went public within a few years, enabling him to launch his next venture, Nytric, in 1999.

Though he's committed to retaining Canadian talent, Utukuri is also acutely aware of the increasingly collaborative, global nature of the engineering profession and the rich perspectives that exchanges can provide. His latest contributions to Skule™ have included supporting EngSci's Summer Research Opportunities Program, which provides financial support to students who land undergraduate research positions at other top institutions abroad.



Gull Lake provides incredible opportunities to introduce nature's biological problem-solving processes. I can't think of a better way to orient students to issues of resilience and sustainability. The next generation of engineers needs CAMP more than ever.

Peter Halsall (CivE 7T7)
Halsall Family Foundation



To strengthen a Skule™ tradition

CAMP (Civil and Mineral Practicals) evokes enduring memories of learning and camaraderie among those who spent time at Gull Lake as part of their Skule™ experience. Since 1920, more than 8,000 students have ventured there to hone their engineering competencies in the natural environment 200 kilometres north of Toronto.

"Natural systems have often been destroyed rather than integrated into our engineering solutions," says Peter Halsall, who founded the green building services firm Halsall Associates and led the charge to integrate sustainability into Canada's urban areas. "Knowing how to work with and learn from them has proven to yield much more sustainable and resilient outcomes."

Halsall is among a dedicated group of alumni helping to launch a new era for CAMP as it approaches its 100th anniversary. U of T Engineering and its supporters have maintained the site and its legacy buildings to keep CAMP's valuable experiential learning opportunities alive. Now, the Centennial Campaign for CAMP aims to raise \$1.5 million to fund essential structural upgrades and better serve the educational landscape and changing CAMP student population, of which nearly 40 per cent are women.

Learn about how you can support the Centennial Campaign for CAMP at alumni.engineering.utoronto.ca/camp



We often hear about bad experiences women have in technology. I hope to remind young women that there are people who have had very positive experiences as well.

Natasha Lala (CompE 9T8)
Chief Operating Officer, ApplePie Capital



To encourage women engineers

"I use the problem-solving and analytical skills I honed in ECE every day," says Natasha Lala, chief operating officer at ApplePie Capital, a financial solutions provider dedicated to the franchise industry. Based in San Francisco, she says being in a tech hub inspires collaboration over competition. "My friends and classmates in ECE were very bright but also very helpful when someone was stuck, and that high-calibre, cooperative environment is one I always try to model in building my teams today."

Lala has supported young women and girls as a coach and mentor throughout her career and is now in a position to give back financially. "This is a new and exciting step for me," she says. During her Skule™ days, she saw first-hand how important donor support was for some of her classmates. Last year, she established a Women in Technology award for a third- or fourth-year ECE student. "If a scholarship will help keep them on their path in some small way, I would be glad for that impact."

Lala has also served on the ECE Alumni Board of Advisors since 2014. "I believe many of us want to make a difference, but aren't always sure how to contribute. In my experience, the Faculty welcomes support in many ways, and is happy to engage on a variety of levels. My Skule™ experiences started me down a great path personally and professionally, and by giving back we can collectively ensure that future graduating classes reap the same rewards."



I can find projects I'm interested in supporting and know that U of T Engineering is going to do the best possible job with the resources available.

Dr. Lorne E. Heuckroth (EngSci 5T8, UTIAS MASc 6T0)
Financial Advisor



To bring U of T innovations to the world

After a career leading international development projects in Nigeria, Indonesia, Pakistan, Tanzania and Russia, Lorne Heuckroth found himself a bit restless as a retiree. "I understand the needs of the countries I worked in," he says. "I saw how much I could do with government funding and I had a strong urge to continue doing projects using my own resources."

While in Tanzania, Heuckroth developed close ties with the medical director of a rural hospital and for five years supported its operations and expansion. Twenty years later, when he learned of Professor Emeritus **Levente Diosady's** (ChemE) work in micronutrient supplementation via fortified salt, he wanted to bring its proven benefits to the mothers and infants the hospital serves. Enabled by Heuckroth's recent gift of \$400,000, which was matched by Grand Challenges Canada, Diosady and his research team will work with hospital staff to provide the immunity-boosting micronutrients to new mothers and their children over the course of a year.

This project will not only help to safeguard the participants against disease and blindness and reduce mortality rates, it will also help researchers refine their procedures for administering micronutrients in remote areas. "It will be the biggest project I've supported, and if it succeeds, we'll go even further," says Heuckroth, who also sponsors master's-level students from developing countries at UTIAS and generously supported the Heuckroth Learning Commons in the Myhal Centre.



Renewable energy is critical for the future sustainability of stable societies. Engineers have the skill sets to make a difference.

Anne Twigge-Molecey and
Chris Twigge-Molecey (MIE MASc 6T9, PhD 7T2)
Senior Advisor, Hatch



To support tomorrow's problem solvers

What makes a meaningful birthday gift? Sometimes, it's a gift that helps others. In honour of Chris Twigge-Molecey's 65th birthday, his wife, Anne, established a scholarship in his name to be awarded to talented mechanical engineering students with an interest in sustainable energy.

"Anne's prime motivation for the donation is that she knows sustainable energy and U of T are both close to my heart," Chris says. The couple hopes to inspire the next generation of engineers to advance renewable energy technologies and work toward more sustainable practices in industry, where Chris spent his long and successful career at Hatch Ltd.

"U of T has had a huge impact on us both," Anne says. They met nearly 50 years ago when Chris was at Massey College earning his master's degree, and were married on campus the following year at Knox College Chapel. Anne performed in theatre productions across Canada and later focused on visual arts while Chris developed technologies for Hatch, acquiring several patents related to environmental control systems and sustainability before switching to management and consulting. Chris's work took the couple across the globe as he established Hatch operations in Russia, South America and China.

So far, six students have received the Dr. Chris Twigge-Molecey Scholarship in Mechanical Engineering, and Anne and Chris have made it a point to meet each of them.



U of T and generous donors gave me the gift of a world-class education. It taught me to self-learn quickly, and my teams and I are much more entrepreneurial, innovative and willing to try new things as a result.

Alvin Mok (EngSci 0T3)
Head of Global Platform and Insights, Orbis Investments



To pay it forward

As an engineering science student at U of T, Alvin Mok's potential was recognized early. He was awarded several scholarships that, along with income from summer jobs, enabled him to graduate debt-free. He hit the ground running, starting his first company, working for Microsoft and earning an MBA from Harvard Business School within five years of graduation.

In 2010, Mok joined Orbis, an investment management firm headquartered in Bermuda, and now oversees its global platform and big data operations. Orbis has since become a key supporter of the Division of Engineering Science, hiring its graduates and sponsoring events such as the Orbis Challenge video game artificial intelligence (AI) competition and a *Dragon's Den*-style event in fourth-year capstone courses.

Besides turning Orbis into a strong Skule™ partner, Mok is supporting U of T Engineering by contributing toward a Boundless Promise scholarship. The program matches donations of \$25,000 or more to provide awards to students whose full financial needs aren't covered by government aid, fulfilling U of T's promise that no student admitted to the University will be unable to attend for lack of funds.

"I believe in the model of a flexible gift, as it allows the University to deploy the support to areas of greatest need," Mok says. "Giving is a chance to make things better for the next generation. As someone who has benefited from others' support, I figured it is just the right thing to do." ☐

A History of Transformational Gifts

Over the past decade, **Frank Milligan** (MechE 4T8) and his wife, Barbara, have generously supported biomedical engineering research in the Department of Mechanical & Industrial Engineering and the Institute of Biomaterials & Biomedical Engineering. To date, more than 200 talented graduate students have received the prestigious Barbara and Frank Milligan Graduate Fellowship.

Kathleen and **Bill Troost** (ChemE 6T7) have given over \$7 million to U of T Engineering. Their gifts have funded chemistry facilities upgrades, established scholarships and provided longstanding support for the Institute for Leadership Education in Engineering (ILead).

Richard M. Clarke (ChemE 5T4) contributed \$1 million to support programs that challenge students to demonstrate their engineering leadership capabilities. One of his many initiatives is the establishment of an award for students who show exceptional team leadership in the Multidisciplinary Capstone Design Course.

Gerald Heffernan's (MMS 4T3) \$5-million contribution empowers U of T Engineering students to bring their innovations to market. He established the Heffernan Commercialization Fellowships for graduate students and is also funding space for The Entrepreneurship Hatchery student incubator at its new home in the Myhal Centre.

Margaret and **Lee Lau's** (ECE 7T7, MASc 8T2) \$2.5-million gift funds a leading-edge 500-seat auditorium in the new Myhal Centre. The only lecture hall of its kind in North America, it will enable collaborative, technology-enabled instruction and improve how the next generation of engineers will learn and create. The Lau family has contributed more than \$7 million to the Faculty.



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uoftengineeringconnect.ca



Skule™ Notes

News from Your Field, U of T Engineering awards and honours, and reflections from your community.



Using an ordinary polyurethane sponge, Pavani Cherukupally has been able to reduce the amount of oil contamination in water from 8,000 parts per million to 54.

SPONGING UP OIL FROM TAILINGS PONDS

Under the supervision of Professors **Chul Park** and **Amy Bilton** (both MIE), MIE Phd candidate **Pavani Cherukupally** has designed a system that uses polyurethane sponges to remove droplets of oil or other contaminants dispersed in water—ideal for the remediation of oilsands tailings ponds.

Due to attractive forces, the oily contaminants stuck to the surface of the sponge, while the clean water flowed straight through. Her sponge system removed more than 99 per cent of the suspended oil.

“The slight positive charge on the polyurethane attracts the slight negative charge on the

suspended oil droplets,” Cherukupally says. “As well, the pore size is small enough to provide a large surface area, but not so small that the sponge gets clogged with debris.”

Cherukupally was inspired to work in water treatment by witnessing the slow, gradual pollution of the Musi River in her home city of Hyderabad, India.

“Nobody knew how to clean the water, and a lot of my classmates got sick,” she says. “When this project was proposed to me I thought: ‘This is what I should be doing.’”

PHOTO: BY KEVIN SOOBRIAN

PARTICULATES ON PUBLIC TRANSIT



New research by Professor **Greg Evans** (ChemE) shows that Canadian subways increase our personal exposure to certain airborne pollutants, even as they decrease overall emissions by reducing the use of gasoline-powered vehicles.

↑ Professor Greg Evans says he will continue using subways for his daily commute.

Evans and his collaborators from Health Canada and McGill University used portable detectors to measure the levels of PM2.5—airborne particles smaller than 2.5 micrometres—on subway platforms and trains. A typical outdoor PM2.5 value for Toronto would be on the order of 10 micrograms of particles per cubic metre of air. On Vancouver’s subway system, the average was 17 micrograms per cubic metre, while Montreal averaged 36 micrograms per cubic metre. Toronto had the highest levels, at an average of 100 micrograms per cubic metre. The results were published in *Environmental Science & Technology*.

On the street, combustion sources such as cars and trucks are the dominant contributors to PM2.5 levels.

However, subway trains are electric, so the particles in subway stations must be coming from a different source. After analyzing the particles, the researchers suggest that abrasion between the wheels and track of the train could be grinding off tiny steel particles.

According to Evans most commuters only spend about an hour or so on the subway each day. That means that the overall daily exposure is increased by about 20 per cent. Still, long-term exposure to PM2.5 pollution has been associated with negative effects on the respiratory and cardiac systems. Evans says exposure could be reduced by upgrading ventilation systems and cleaning up the dust that may be the source of the particles.

New ChemE professors



Ariel Chan (pictured) Assistant Professor, Teaching Stream, expert in scaling up chemical manufacturing processes

Nikolai DeMartini Assistant Professor, NSERC Industrial Research Chair in the Role and Fate of Inorganics in the Industrial Processing of Woody Biomass

Ning Yan Distinguished Professor in Forest Biomaterials Engineering and Chair in Value-added Wood and Composite



Members of the Elements of Bio-Mining project team at the “In the Footsteps of Sudbury’s Miners” exhibit at Science North in Sudbury, Ont.

ENGINEERING COLLABORATION AIMS TO TURN MINE WASTE INTO VALUABLE METALS

Researchers involved with the Elements of Bio-Mining (EBM) project—an industry-academic collaboration led by U of T Engineering—are studying the use of microorganisms to treat mine waste in tailings ponds.

The EBM project aims to remediate legacy mine waste, particularly large volumes of sulfide-laden waste tailings and rocks resulting from base metal extraction from sulfide minerals across Canada. ChemE researchers are harnessing the capabilities of microbial communities to stabilize

wastes containing selenium and sulfur in minerals found in mine waters and tailings, while simultaneously allowing for commercial base metal recovery. The project also aspires to reduce the risk of selenium being released into the environment at toxic levels.

EBM is led by professors **Vladimiro Papangelakis** and **Elizabeth Edwards** along with colleagues from Laurentian University and the University of British Columbia. Additional participants include ChemE professors **Erin Bobicki**, **Krishna Mahadevan**, **Brad Saville** and **Alexander Yakunin**.

An Ontario Research Fund—Research Excellence grant worth \$12 million was awarded to EBM last summer.

BOTTOM: BY SEAN CAFFEY

A CANADIAN TEACHING CITY FOR ENGINEERING STUDENTS

In 2017, the City of Oshawa became Canada’s first-ever living laboratory for urban research, allowing stu-

dents and faculty to probe complex municipal issues and test practical solutions for the future.

A memorandum of understanding (MOU) signed by U of T Engineering and the Canadian Urban Institute,



“With this innovative partnership, through internships and research opportunities, U of T Engineering students will study and resolve challenges in today’s urban setting,” says Professor Brent Sleep.

the University of Ontario Institute of Technology, Durham College and the City of Oshawa, creates a first-of-its-kind partnership that provides unparalleled opportunities for researchers and students to collaborate with city managers and better understand the challenges they face. It will also provide a testbed to gather data on the effectiveness of potential solutions—from smart traffic lights to new drinking water treatment technologies—at the pilot scale. The partnership also seeks to deepen evidence-based policy development and research-driven innovations from students in the Master of Engineering in Cities Engineering and Management program.

“Access to real-time urban data and systems will provide significant insights and transformative opportunities to assess problems and identify scalable and sustainable solutions for tomorrow,” says Professor **Brent Sleep**, chair of the Department of Civil & Mineral Engineering, who signed the MOU on behalf of the Faculty. “These types of experiences outside of lecture halls encourage students to interact with a multitude of stakeholders, learning to support and interact with policymakers, residents and their future colleagues.”

EXPANSIVE REIMAGINING OF THE LASSONDE INSTITUTE OF MINING

Transformation is underway at the interdisciplinary Lassonde Institute of Mining with a strong focus on sustainability and technology advancement. In April, Professor **Lesley Warren** (CivE) was appointed as the Institute’s new director.

“The Lassonde Institute takes the U of T view on things—we will be the best, we will look to the future rather than resting on the past and will find innovative ways to make a real difference,” Warren says.

The Institute is welcoming new principal investigators to expand its innovative research agenda and recently opened the \$1.1-million

Mining Water and Environment Facility within the Galbraith Building. Its industry portfolio also is growing through the establishment of the Lassonde Mining Hub (The HUB). The HUB will serve as a direct pipeline linking cutting-edge research, faculty and students to mining companies providing transformative solutions to problems facing industry today.

With shared academic and industry directorship, The HUB will be a strategic Canadian centre at the intersection of national and international extractive resource markets.



Professor Lesley Warren (right) and her colleagues mine the genomes of microbes that thrive in wastewater generated by the resource extraction industry.

BOTTOM: COURTESY LESLEY WARREN



↑ Vivienne Sze at the 69th Engineering Emmy Awards in Los Angeles, Calif.

ECE ALUMNA ON EMMY AWARD-WINNING TEAM FOR WORK ON VIDEO COMPRESSION

Alumna **Vivienne Sze** (ElecE 0T4) was part of a winning team at the 69th Engineering Emmy Awards, announced Sept. 27, 2017. The joint collaborative team on video coding (JCT-VC) developed High Efficiency Video Coding (HEVC)—the latest video coding standard that has been adopted, or selected for adoption, by all ultra-high definition (UHD) television distribution channels, including terrestrial, satellite, cable, fibre and wireless.

“HEVC delivers higher compression than previous standards, while still delivering high processing speeds and low power consumption,” Sze says. “It was exciting for the team to be

recognized by the Television Academy with an Emmy—it was such a unique experience.” Sze also co-edited a book on the topic, entitled *High Efficiency Video Coding (HEVC): Algorithms and Architectures*.

Sze—now a professor at Massachusetts Institute of Technology—is no stranger to recognition: she earned the Jin-Au Kong Outstanding Doctoral Thesis Prize in 2011 and NSERC’s Julie Payette fellowship in 2004. Her research focuses on energy-aware signal processing algorithms, and low-power hardware design for applications such as computer vision, deep learning, autonomous navigation and video compression.

AWARDING ECE EXCELLENCE



At convocation in June 2017, **Catherine Lacavera** (CompE 9T7), pictured above, was bestowed a Doctor of Laws, honoris causa, by the University of Toronto in recognition of her career and her contributions to her alma mater. Lacavera is a world-renowned leader in the field of intellectual property (IP) law and the director of IP, litigation and employment at Google.

Sandro Young (CompE 1T6 + PEY) was awarded one of three Governor General’s Silver Medals, given to U of T’s most academically outstanding undergraduate students. Additionally, he received the John Black Aird Scholarship, awarded to the top student at U of T.

In April 2017, Professor **Vaughn Betz** (ECE) was renewed as the NSERC/Intel Industrial Research Chair in Programmable Silicon. The funds associated with the chair will support research activities and equipment to develop new field-programmable gate array (FPGA) hardware along with software tools to implement designs that make FPGAs more energy-efficient and versatile, potentially improving areas like environmental impact and health care.

TOP LEFT: BY MINHUA ZHOU TOP RIGHT: BY LISA SAKULENSKY

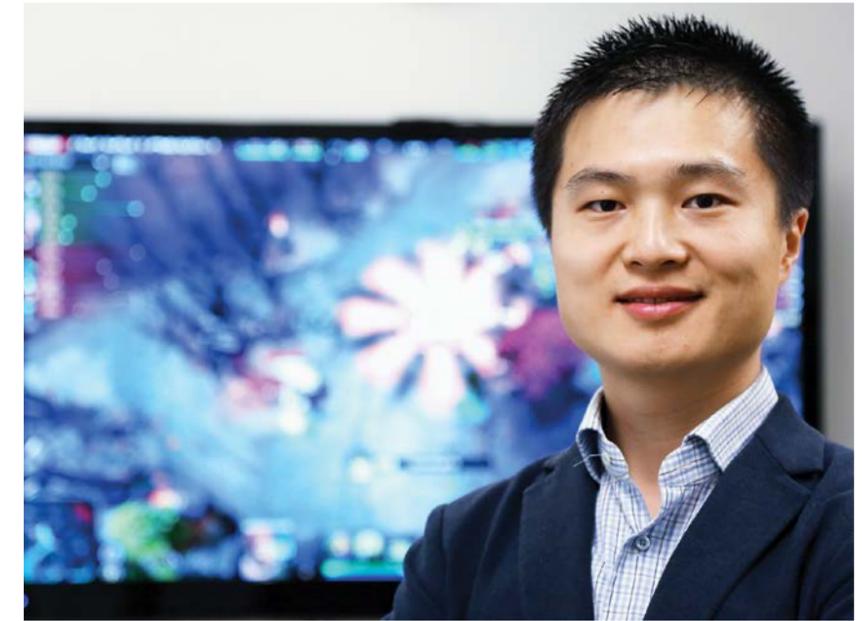
ALUMNUS FUNDS U OF T’S FIRST ESPORTS SCHOLARSHIP

A generous donation from alumnus **Victor Xin** (EngSci 0T8 + PEY) will fund a new scholarship to support a student with high academic achievement and a passion for electronic sports (eSports), or competitive video gaming. It is the first time in U of T’s history that a scholarship has been established with video gaming as part of the eligibility criteria.

“We should reward leadership attributes no matter how they manifest themselves,” says Xin, who is managing partner at Athena Capital Partners, a Toronto-based investment firm. “I want to help students who pursue leadership and personal development, but go about it a different way.”

The Victor Xin Scholarship in eSports will be awarded to a full-time undergraduate student in the Faculty of Applied Science & Engineering who has achieved a minimum 3.5 GPA. The recipient will demonstrate a passion for eSports or gaming through engagement in a leadership role or participation in extra-

“We need to reward the mavericks among us who may not fit into the mold of a traditional leader,” Victor Xin says. L

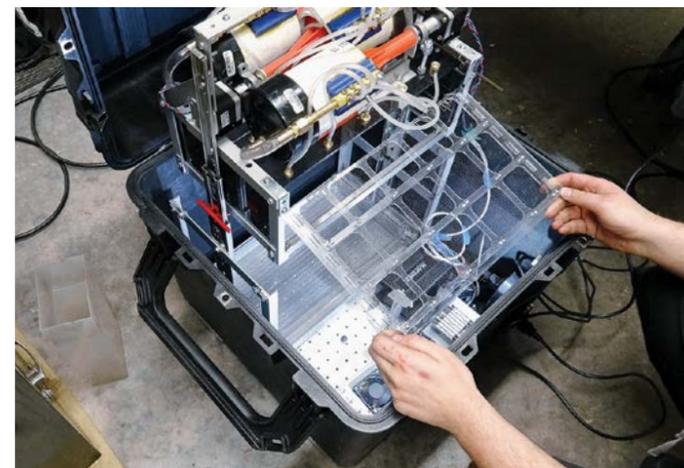


curricular activities. Course selection, design projects or research may also be considered. The first scholarship will be awarded in fall 2018.

Xin, who chairs U of T Engineering’s Alumni Mentorship Program, started the University of Toronto eSports Club and organized the University of Toronto Cyber Games in 2008, the first student-run eSports tournament held on a campus in North America.

Today, eSports is a lucrative global business, with revenues expected to exceed \$1 billion by 2019.

“There are trailblazers on campus who are rallying a different set of students to build campus organizations focused on an alternative way of learning to lead and succeed in life,” Xin says. “Society may not recognize them yet—but we shouldn’t let them fall through the cracks.”



↑ The experimental apparatus contains pumps and tubes that simulate the operation of a 3D printer. To simulate a molten thermoplastic, the team is using ordinary corn syrup.

UNRAVELLING A COILED PHYSICS MYSTERY

Last summer, **Neell Young** (EngSci 1T4 + PEY, UTIAS MSc 1T7), **Caulan Rupke**, **Michael Lawee** and

Andrew Ilersich (all Year 4 EngSci) took the flight of a lifetime to solve a sticky mystery: how exactly does honey dripping from your spoon form the shape of a coiled rope when it lands on a plate? They had the rare chance to carry an experiment they designed onto a microgravity flight similar to those used to train astronauts. By taking gravity out of the equation of the “liquid rope coil” effect, they want to develop a rigorous model of this poorly understood effect that could allow 3D printers to create lighter, stronger and more complex materials. Their findings inform the development of 3D printers for use on long space missions, letting astronauts print tools on demand instead of carrying a large number of potentially unnecessary items with them.



Deepa Kundur commences term as chair of Engineering Science

“Engineering Science has a very unique culture, and that’s because our students are fearless,” says Professor **Deepa Kundur** (ECE). Kundur began her appointment as chair of the Division of Engineering Science on Jan. 1, 2017.



↑ Professor Milica Radisic, left, and her team recently developed an injectable tissue patch that could help repair hearts, livers or other organs damaged by disease or injury, potentially eliminating the need for invasive transplant surgeries.

PROFESSOR MILICA RADISIC EARNS THE STEACIE PRIZE

Professor **Milica Radisic** (IBBME, ChemE) has been named the 2017 recipient of the Steacie Prize, awarded each year to one engineer or scientist 40 years of age or younger who has made notable contributions to research in Canada. The prize is administered by the E.W.R. Steacie Memorial Fund, a private foundation dedicated to the

advancement of Canadian science and engineering.

As the Canada Research Chair in Functional Cardiovascular Tissue Engineering, Radisic has made transformational advances in tissue engineering resulting in new methods for growing human tissue in the lab. She was the first in the world to use electrical impulses and specially designed bioreactors to guide isolated heart cells to assemble into a beating structure. These beating heart tissues are already being used to test potential drugs for side effects.

Radisic and her team have created the **AngioChip**, a 3D, fully vascularized piece of heart tissue that beats in real time. Her technologies are the foundation for the start-up **TARA Biosystems**, which is now working with several major pharmaceutical companies on drug discovery and validation using the matured human heart tissues developed in her lab.

“I am truly honored and humbled to receive this prize in memory of E.W.R. Steacie,” Radisic says. “It is important to emphasize that I have not done all of the work alone. I am thankful to the many students and post-docs in my lab who made the work possible and the network of colleagues and collaborators at the University of Toronto.”



NEW PROGRAM OFFERS ENGINEERING TRAINING TO MEDICAL STUDENTS

Jason Jaewoo Park wants to be a doctor who can impact patient outcomes with technology. A new MD-oriented program developed by IBBME professors **Julie Audet**, **Christopher Yip** and the Faculty of

↙ Jason Jaewoo Park is one of seven U of T medical students in the first cohort to pair their MD education with medical device training.

Medicine’s Dr. Marcus Law is enabling him to do so. Park is among the first of seven U of T MD students to pair their full-time medical education with training in biomedical device design through a part-time Master of Engineering (MEng) program offered by IBBME.

“When I entered medical school, I wanted to learn more about medical devices that are essential for providing high-quality care,” says Park, a second-year MD student at the University of Toronto. “As a future physician, I want to help find solutions to shortcomings in the technology we use to provide the best possible care for our patients.”

Through this two-year, part-time program, medical students learn more about how biomedical devices are created and brought to market through a series of courses in biomedical sciences, engineering technology and commercialization. It also includes an applied internship on a schedule that complements the MD curriculum.

TOP: BY NEIL TA BOTTOM: COURTESY JASON JAEWOO PARK

COFFEE SHOPS AND 24-HOUR ATMS ARE THE BEST LOCATIONS FOR LIFE-SAVING AEDS



↑ Professor Timothy Chan (left) and Christopher Sun (right) studied data on cardiac arrest locations in Toronto to determine a list of “Top 10” businesses where placing automated external defibrillators would save lives—Tim Hortons coffee shops topped the rankings.

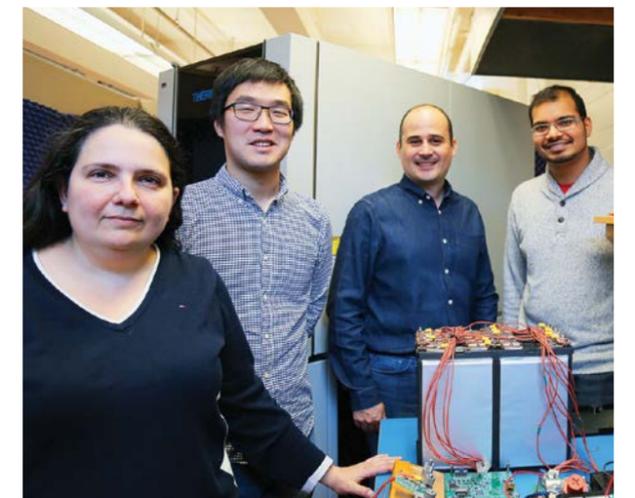
ATMs and coffee shops make ideal locations for placing automated external defibrillators (AEDs), according to Professor **Timothy Chan** (MIE) and **Christopher Sun** (MIE PhD candidate), in collaboration with St. Michael’s Hospital.

Quick response can be the difference between life and death, and that means having immediate access to a nearby AED. Their study looked at where cardiac arrests occur to find locations where AEDs would be most valuable. Three coffee shop chains—Tim Hortons, Starbucks and Second Cup—as well as five major banks with many ATM locations, including RBC and Scotiabank, were among the top 10 locations. The researchers hope this new study could soon lead to better AED placement.

DEVELOPING THE NEXT GENERATION OF BATTERY TECHNOLOGY FOR ELECTRIC VEHICLES

Researchers from MIE and ECE are designing the automotive battery of the future. The collaboration addresses several key hurdles that currently limit the widespread manufacturing of electric vehicles. Namely, the high cost and limited performance of today’s conservatively designed lithium battery packs, which ultimately dictate the electric vehicle’s driving range and longevity.

Daniela Galatro (MIE PhD candidate), **Zhe Gong** (ECE MAsC candidate), **Carlos Da Silva** (MIE PhD 1T6) and **Kshitij Gupta** (MIE MAsC candidate), pictured left to right, are members of the multidisciplinary team led by Dean **Cristina Amon** (not pictured) that is developing a cooling system that will tightly control thermal performance, not only to keep the battery temperature within a safe range but to extend the lifespan of the battery.



MIDDLE: BY ALLUMSKIMEDIA BOTTOM: BY LIZ DO

MIE ALUMNA NAMED MISS UNIVERSE CANADA

Lauren Howe (IndE 1T6), the reigning Miss Universe Canada, is using her platform to advocate for girls and women in STEM fields.

“Equality for women in STEM is still a battle being fought,” Howe says. “Not only is there a gap in the number of women who are working in STEM fields, but also a gap in pay between men and women. Part of this solution comes from what we can do now. Young women will likely be much more drawn to STEM fields if we can show that we aren’t afraid of the challenge ourselves. By having female mentors that are inspiring and accessible, we pave a path for generations to come.”

Howe continued on to the Miss Universe Pageant in November, finishing in the top 10 of 92 contestants. She first competed for the Canadian crown two years prior and finished as second runner-up. Now, she’s happy she didn’t win earlier. “I was still in second year of engineering, and looking back, I learned so much in third and fourth year that I can now apply,” she says. “A lot of that experience came through my capstone project,” designing a sustainable sanitation facility that uses wastewater technology under

the supervision of Professor **Mark Fox** (MIE).

Howe says she was drawn to study industrial engineering because of the way it combined optimization with human-centred design, and because of the wide variety of industries in which it can be applied.

↑ Lauren Howe was crowned Miss Universe Canada at a pageant held in Toronto on October 7, 2017.



Left to right: Human-Powered Vehicles Design Team members Calvin Moes, Alan Petit (MSE 1T6 + PEY), Isaac Chung (EngSci 1T7 + PEY), Thomas Ulph (EngSci 1T6), Bill Kong and Professor Jun Nogami with their speedbikes Eta Prime and Bluenose.



MSE STUDENT IS 2017'S FASTEST HUMAN

A team led by **Calvin Moes** (MSE PhD candidate) took first place at the 2017 World Human Powered Speed Challenge. The vehicle Eta Prime, developed by the U of T Engineering Human-Powered Vehicles Design Team (HPVDT), was clocked at an impressive 127.6 kilometres per hour, the fastest in this year's competition at Battle Mountain, Nev.

Eta Prime's design is modelled on Eta, the vehicle that currently holds the record for the world's fastest bicycle at 144.17 km/h. Though it did not race at this year's competition, Eta was the result of a long-standing collaboration between HPVDT and AeroVelo, a company founded by U of T Engineering alumni **Todd Reichert** (EngSci 0T5, UTIAS PhD 1T1) and **Cameron Robertson** (EngSci 0T8, UTIAS MSc 0T9). It was only natural that HPVDT build on this expertise to create their next vehicle.

Eta Prime's carbon-fibre shell was cast using the same moulds as were used for Eta, but the vehicle also included innovations such as an overhauled carbon-fibre frame and a redesigned braking system. Eta Prime is 20 per cent lighter than Eta, but as with any speedbike, much depends on the rider. To that end, Moes underwent an eight-month training regimen that reduced the gap in power output between himself and Reichert, Eta's rider, by about half.

"It is incredibly valuable for students to participate in design teams, and then to appear at international competitions," says **Jun Nogami**, chair of MSE, who also serves as HPVDT's faculty adviser and a timekeeper at the competition. "I'm proud of the way the team pushed through adversity to finish with the overall title. Congratulations to Calvin, who is the fastest person in the world for 2017!"

NEW FACULTY JOIN MSE

Last fall, MSE welcomed two new jointly appointed faculty members, **Erin Bobicki** (MSE/ChemE) and **Naomi Matsuura** (MSE/IBBME), while **Yu Zou** (MSE) joined the department in January.

This brings the MSE's faculty count to 20 core members, 20 per cent of whom are women. Professor Bobicki focuses on sustainability in mineral processing, Professor Matsuura studies

nanoparticle-based technologies for medical imaging and drug delivery, and Professor Zou explores materials with extreme properties or under extreme conditions.

Ursula Franklin Women in MSE Seminar Series



MSE was proud to launch the Ursula Franklin Women in MSE Seminar Series this fall. Alumni are encouraged to nominate outstanding female industry and academic leaders in the field of materials engineering to host monthly seminars for MSE students.

MSE's Distinguished Lecture Series provides the U of T Engineering community the opportunity to enhance their understanding of materials innovation and to hear from renowned speakers on state-of-the-art contributions to the field of materials science and engineering. All alumni are welcome to attend. View the full schedule at mse.utoronto.ca.

TOP LEFT: U OF T ARCHIVES TOP RIGHT: BY BAS DE MEIJER

AUTODRIVE: STUDENT TEAM GEARS UP ON SELF-DRIVING ELECTRIC VEHICLE CHALLENGE

A new Chevrolet Bolt vehicle arrived at UTIAS and a student team has until spring 2018 to teach it to drive itself.

U of T Engineering is one of just eight schools from across North America selected to participate in the AutoDrive Challenge, a new intercollegiate autonomous vehicle competition. Sponsors include General Motors, the Society of Automotive Engineers (SAE) and a number of other companies that produce hardware and software for self-driving cars.

More than 50 students have joined the U of T Engineering team, named aUToronto. They include both undergraduate and graduate students, in disciplines ranging from electrical engineering to aerospace engineering and computer science.

The challenge will take place over three years, with teams assembling

each spring to demonstrate their progress in reaching key milestones. The first of these competitions will take place in Yuma, Ariz.

By then, the car needs to be able to complete three tasks: first, it must drive down a straight road

while staying in its lane. Second, it must navigate around static obstacles, such as pylons, by changing lanes according to the rules of the road. Finally, it must recognize stop signs and stop within a safe distance.

Robert Adragna (Year 2 EngSci) and Mona Gridseth (UTIAS PhD candidate) adjust the lidar system on a self-driving vehicle.



UTIAS IN THE NEWS



Professor **Angela Schoellig** (UTIAS) has been named one of the world's top Innovators Under 35 by *MIT Technology Review* magazine. Professor Schoellig is in the "pioneer" category because "autonomous cars, drones, and manufacturing robots have raised the [safety] stakes [and] her algorithms are helping self-driving and self-flying vehicles get around more safely."



The UTIAS Space Flight Lab designed, built and successfully launched NorSat-1 and NorSat-2. The Norwegian-financed satellites will be used to monitor ship traffic, communicate with ships, conduct fisheries management, help in search-and-rescue operations and provide data for scientific experiments. Learn more at utias-sfl.net.



Working with Google's Larry Page on the Kitty Hawk project, alumni **Cameron Robertson** (EngSci 0T8, UTIAS MSc 0T9) and **Todd Reichert** (EngSci 0T5, UTIAS PhD 1T1) debuted a prototype of The Flyer, a personal flying machine. Robertson and Reichert previously made history with their human-powered ornithopter and the world's fastest bicycle. kittyhawk.aero.

BOTTOM MIDDLE TO RIGHT: BY UTIAS-SFL.NET; YOUTUBE

Awards and Honours

U of T Engineers and researchers continue to earn more awards and honours than faculty at any other Canadian school. Their ground-breaking work is a source of pride for our Faculty and alumni around the world. Visit uoft.me/engineeringawards for a complete list of Faculty awards and honours.

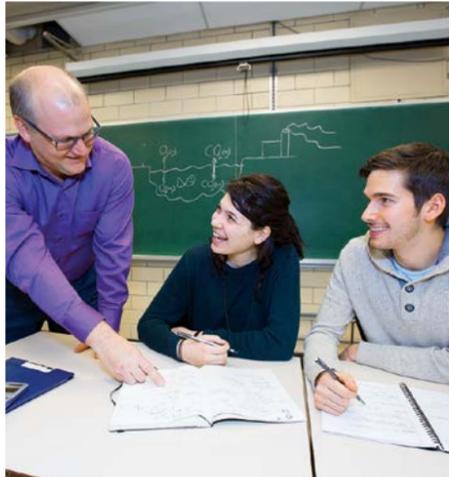
FACULTY AWARD HIGHLIGHTS



Warren Chan (IBBME)
U of T Distinguished Professor
of Nanobioengineering

The Distinguished Professor Award recognizes accomplished individuals with exceptional promise. Professor Warren Chan leads a world-renowned research program in biomedical nano-technology that has garnered international recognition for its innovation, breadth and impact. His group created a rapid diagnostic system that can detect multiple diseases from a single drop of blood. In 2018, he became director of U of T's Institute of Biomaterials & Biomedical Engineering (IBBME).

Another focus of Chan's research is the development of technology for delivering chemotherapy drugs directly into tumours, minimizing the side-effects of traditional chemotherapy treatments.



Greg Evans (ChemE)
3M National Teaching Fellowship

Professor Greg Evans received a 3M National Teaching Fellowship from the Society for Teaching and Learning in Higher Education—Canada's most prestigious recognition of excellence in educational leadership and teaching.

Evans' teaching philosophy involves changing the traditional role of professor from the stereotype he calls "sage on the stage," toward becoming a "guide on the side." In class, he encourages his students to generate solutions as a group rather than look to him for the correct answer, and to relate classroom concepts to practical situations. Evans says his efforts are inspired by the educators who helped shape his own career, including the late Professor **Robert Jervis** (ChemE), who gave him his first summer research project.



Brenda McCabe (CivE)
Fellow
Engineering Institute of Canada

Professor Brenda McCabe has been elected a Fellow of the Engineering Institute of Canada in recognition of exceptional contributions to engineering.

McCabe has a distinguished record of achievement and service. In 2006, she was appointed vice-dean, graduate studies—the Faculty's first female vice-dean. In 2008, she was appointed chair of the Department of Civil Engineering—U of T Engineering's first female department chair. During her term, she worked to further increase the department's profile, improve the student experience, integrate sustainability into the curriculum, revitalize the Gull Lake Survey Camp and promote a sense of community.

LEFT: PHOTO BY MARTIN LIPMAN/NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL OF CANADA MIDDLE: BY JOHNNY GUATTO

SELECTED FACULTY AWARDS

American Association for the Advancement of Science Fellow

Kamran Behdinan (MIE)
Zheng-Hong Lu (MSE)
Jeffrey Packer (CivE)
David Sinton (MIE)
Yu Sun (MIE)

American Concrete Institute Joe W. Kelly Award

Frank Vecchio (CivE)

American Society of Mechanical Engineers Honorary Member

Cristina Amon (MIE)

Engineering Conferences International Scale-Up and Manufacturing of Cell-Based Therapies Award

Peter Zandstra (IBBME)

Institute of Electrical and Electronics Engineers Fellow

Ravi Adve (ECE)
Sorin Voinescu (ECE)

Institute of Electrical and Electronics Engineers Information Theory Society

Aaron D. Wyner Distinguished Service Award
Frank Kschischang (ECE)

Institute of Materials, Minerals and Mining (U.K.) Fellow

Paul Young (CivE)

Killam Prize in Engineering

Molly Shoichet (ChemE, IBBME)

Sloan Foundation

Sloan Research Fellowship
Angela Schoellig (UTIAS)

SPIE (The International Society for Optical Engineering) Fellow

Peter Herman (ECE)
Hani Naguib (MIE, MSE)

Technical Association of the Pulp and Paper Industry Gunnar Nicholson Gold Medal Award
Honghi Tran (ChemE)

Technical University of Munich TUM Ambassador

Frank Kschischang (ECE)

Tissue Engineering & Regenerative Medicine International Society Lifetime Achievement Award
Michael Sefton (ChemE, IBBME)

Canadian Academy of Engineering Fellow

Nazir Kherani (MSE, ECE)
Deepa Kundur (ECE)
Milica Radisic (IBBME, ChemE)
Murray Thomson (MIE)
Honghi Tran (ChemE)

Canadian Society for Civil Engineering

Albert E. Berry Medal
Heather MacLean (CivE)
Camille A. Dagenais Award
Bryan Karney (CivE)
Fellow

Brent Sleep (CivE)
Nasser Ashgriz (MIE)

Canadian Society for Mechanical Engineering

Robert W. Angus Medal
Kamran Behdinan (MIE)

Chemical Institute of Canada/Society for Chemical Industry

Kalev Pugi Award
Molly Shoichet (ChemE, IBBME)

Engineering Institute of Canada

John B. Stirling Medal
Jean Zu (MIE)
Sir John Kennedy Medal
Cristina Amon (MIE)

Engineers Canada

Fellow
Levente Diosady (ChemE)
Young Engineer Achievement Award
Amy Bilton (MIE)

Metallurgy and Materials Society of the Canadian Institute of Mining, Metallurgy and Petroleum

Brimacombe Award
Kinnor Chattopadhyay (MSE)
Environmental Award
Charles Jia (ChemE)

March of Dimes Canada

Jonas Salk Pioneer Award
Tom Chau (IBBME)

Office of the Governor General Governor General's Innovation Award

Paul Santerre (IBBME)

Royal Society of Canada Fellow

Reza Iravani (ECE)
Javad Mostaghimi (MIE)
Milica Radisic (IBBME, ChemE)

Royal Society of Canada College of New Scholars, Artists & Scientists Member

Hani Naguib (MIE, MSE)
Wei Yu (ECE)

Sandford Fleming Foundation

Wighton Fellowship
Dawn Kilkenny (IBBME)

Society for Teaching and Learning in Higher Education

3M National Teaching Fellow
Greg Evans (ChemE)

Stem Cell Network

Till & McCulloch Award
Molly Shoichet (ChemE, IBBME)

Ontario Confederation of University Faculty Associations

OCUFA Teaching Award
Jonathan Rose (ECE)

Ontario Professional Engineers Awards

Engineering Medal – Entrepreneurship
Paul Santerre (IBBME)
Engineering Medal – Research and Development
Jan Andrysek (IBBME)
Craig Simmons (MIE, IBBME)

University of Toronto

Early Career Teaching Award
Dawn Kilkenny (IBBME)
Faculty Award
Elizabeth Edwards (ChemE)
Northrop Frye Award
Craig Simmons (MIE, IBBME)



CLAIRE KENNEDY ELECTED CHAIR OF GOVERNING COUNCIL

U of T Engineering alumna **Claire Kennedy** (ChemE 8T9) has been elected chair of the University of Toronto's Governing Council, which oversees the academic, business and student affairs of the University.

She has served on the Governing Council since 2012 as a Lieutenant-Governor-in-Council appointed member, and is active on its Business Board, Pension Committee and Executive Committee.

Kennedy has a long history of engagement in Faculty governance and the engineering community. She has served as a member of the Dean's Strategic Development Council and Campaign Cabinet Executive, member and past chair of the Department of Chemical Engineering & Applied Chemistry's Advisory Board, member and past president of the Engineering Alumni Network, and is the founder of BizSkule, one of the Faculty's most successful alumni outreach programs.

Her volunteer service to U of T was recognized with an Arbor Award in 2007 and a Malcolm F. McGrath Alumni Achievement Award in 2013.

Kennedy is a partner at Bennett Jones LLP. She also is a director of the Bank of Canada, and of Alamos Gold Inc., a publicly traded mining company.

SELECTED ALUMNI AWARDS

U of T Arbor Awards

Joseph De La Riviere (ChemE 7T2)
Peter Denyer (ElecE 7T2)
Diana Facchini (MSE 0T2, MASc 0T5)
Alex Grbic (CompE 9T4, ECE MASc 9T6, PhD 0T3)
Anthony Lacavera (CompE 9T7)
Tom Latta (ChemE 8T0)
John Lo (ChemE 9T2)
Frank Milligan (MechE 4T8)
Paul Ostrander (Friend of CivE)
Donald Sadoway (EngSci 7T2, MMS MASc 7T3, PhD 7T7)
Michael Salamon (ElecE 8T9)
Francis Shen (EngSci 8T1, UTIAS MASc 8T3)
Tony Tsui (ChemE 0T7, CivE MASc 0T9)

Canadian Academy of Engineering Fellow

Perry Adebar (CivE MASc 8T7, PhD 9T0)
Mark Hundert (IndE 7T1)
Christopher Pickles (MMS 7T4, MASc 7T5, PhD 7T7)
John Young (MMS 7T1, MIE MASc 7T4)

Engineers Canada Gold Medal Award

Larry Seeley (ChemE 6T6, MASc 6T8, PhD 7T2)
Meritorious Service Award for Community Service
Ted Maulucci (MechE 8T9)

Ontario Professional Engineers Award Citizenship Awards

Margaret Kende (CivE 6T0)
Benny Pang (EngSci 7T2)
Engineering Medal - Engineering Excellence
Nicholas Stark (MechE 7T8)
Management Medal
Samantha Espley (Geo 8T8)

Women's Executive Network

Canada's Most Powerful Women 2018: Top 100
Nancy Hill (CivE 8T1)
Claire Kennedy (ChemE 8T9)
Jeannette Southwood (ChemE 8T6, MASc 8T8)

—
If you know of an award-winner who should be recognized in a future issue, please email skulealumninews@ecf.utoronto.ca.

SELECTED STUDENT AWARDS

Rhodes Scholarship

Stephanie Gaglione (ChemE 1T6 + PEY)

Schulich Leader Scholars

Aidan Aird (Year 1 EngSci)
Andres Lombo (Year 1 EngSci)

U of T Gordon Cressy Student Leadership Awards*

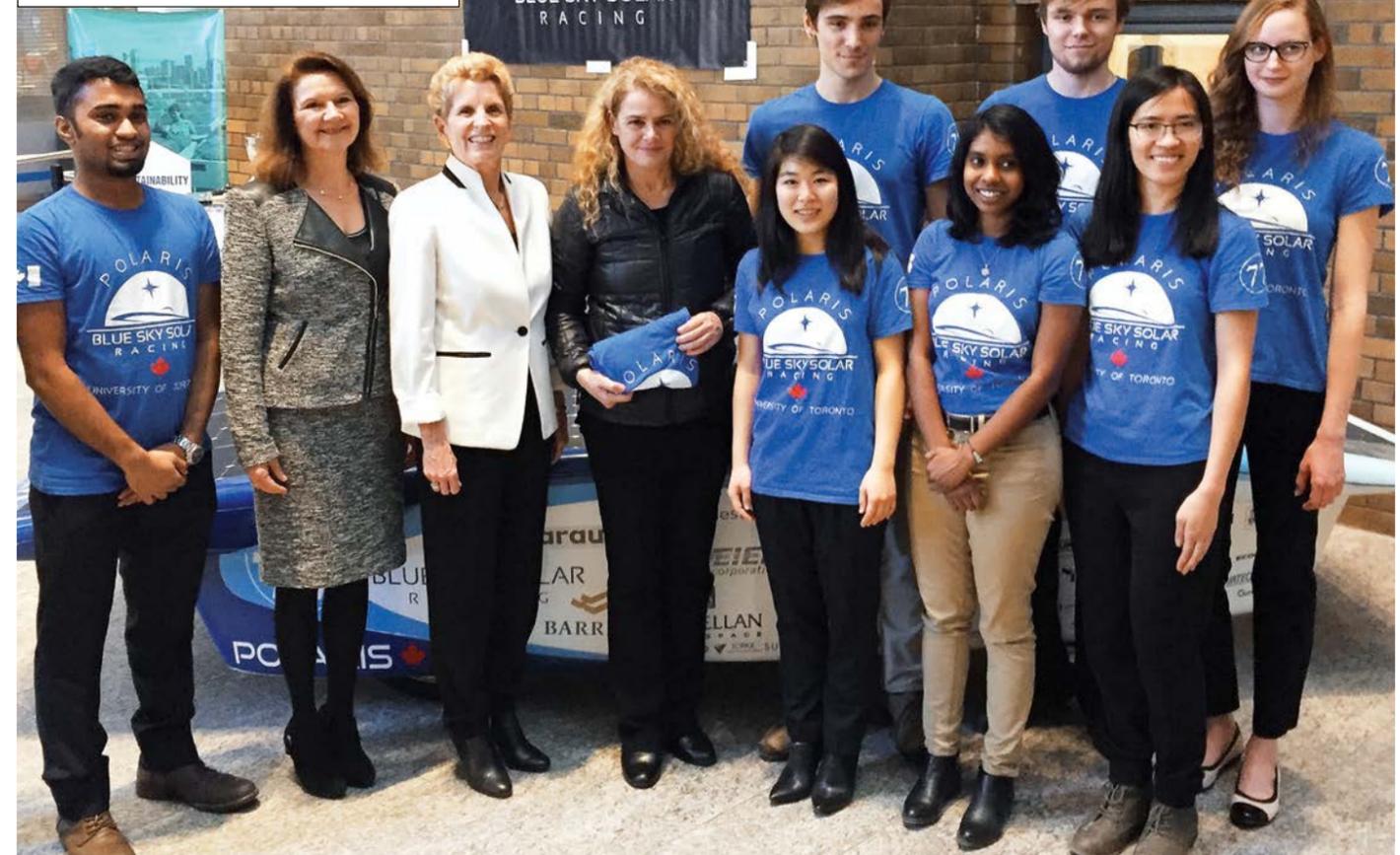
Rejuana Alam (IndE 1T6 + PEY)
Rahul Chandan (EngSci 1T6 + PEY)
Michael De Santi (CivE 1T6 + PEY)
Stephanie Gaglione (ChemE 1T6 + PEY)
Billy Graydon (ElecE 1T6 + PEY)
Sanchit Gupta (CivE 1T6 + PEY)
Malik Ismail (EngSci 1T6 + PEY)
Jeremy Joseph (EngSci 1T76 + PEY)
Andrew Kostruba (ChemE 1T6 + PEY)
Katlin Kreamer-Tonin (EngSci 1T6 + PEY)
Kate Lonergan (MechE 1T7)
Milan Maljkovic (CompE 1T6 + PEY)
Anastasiya Martyts (EngSci 1T6 + PEY)
Nataliya Mykhaylova (ChemE PhD candidate)
Greg Peniuk (EngSci 1T6 + PEY)
Alexander Perelgut (EngSci 1T6 + PEY)
Madhushan Perera (ChemE 1T6 + PEY)
Amreen Poonawala (IndE 1T6 + PEY)
Kevin Rupasinghe (ElecE 1T6 + PEY)
Vibhor Sachdeva (IndE 1T6 + PEY)
Nika Shakiba (EngSci 1T0, IBBME PhD 1T7)
Daksh Sikri (IndE 1T7)
Anamjit Singh Sivia (ElecE 1T7)
Vinoj Suthakaran (MechE 1T6 + PEY)
Nimalan Thavandiran (EngSci 0T9, ChemE MASc 1T2, PhD Candidate)
Anita Tran (MechE 1T6 + PEY)
Dawn Virginillo (MechE 1T6 + PEY)
Areeba Zakir (IndE 1T6 + PEY)

Vanier Scholarships

Neal Callaghan (IBBME PhD candidate)
Marta Overchuk (IBBME PhD candidate)
Reza Rafie (ECE PhD candidate)
Christopher Sun (MIE PhD candidate)

*Alumni were students at the time they received the awards.

Governor General Julie Payette, Ontario Premier Kathleen Wynne and Dean Cristina Amon with members of the U of T Engineering Blue Sky Solar Racing team. Payette met with U of T Engineering students and alumni as part of her first official visit to Ontario on Feb. 20, 2018.



ALUMNA JULIE PAYETTE INSTALLED AS 29TH GOVERNOR GENERAL

Prime Minister Justin Trudeau selected former astronaut **Julie Payette** (ECE MASc 9T0) as the 29th **Governor General of Canada**. As the Queen's representative in the country, she will preside over important events such as the State Opening of Parliament, the speech from the throne and the conferring of the Order of Canada.

"From the first moment the idea came up of appointing Ms. Payette... it was obvious to me that she would make an extraordinary Governor General," Trudeau said.

In her first speech in office at the installation ceremony on Parliament Hill in October, she made an impassioned plea for Canada to make evidence-based decisions and to continue to find solutions to global challenges. "It's our duty to

improve the lives of people in our community," she said, "to diminish the gap and the inequities here and elsewhere and maybe, if we try hard to work together, then we may have a chance to find the answers, and we may be able to tackle global issues, like climate change, nuclear proliferation, poverty and population growth."

Payette obtained an International Baccalaureate at the United World College of the Atlantic in Wales in 1982 and a BEng degree in electrical engineering from McGill University before joining U of T for her graduate studies. She was co-supervised by Professors **Michael Stumm** (ECE) and Graeme Hirst in the Department of Computer Science. Payette later invited Stumm to the launch of one of her shuttle missions,

from NASA's Kennedy Space Center in Florida.

Payette was the first Canadian to board the International Space Station in 1999 and served as flight engineer and lead robotic operator on the Space Shuttle Endeavour 10 years later.

Fluent in French and English, she can also speak—and sing—in Italian, Russian, Spanish and German. Payette was a member of the Tafelmusik Baroque Orchestra Choir from 1989 to 1992.

Named public policy scholar at the Woodrow Wilson Center in Washington, D.C. in 2011, Payette has also been appointed scientific delegate to the United States for the Quebec Government. She was appointed an Officer of the Order of Canada, one of the country's highest civilian honours, in 2010.

FACULTY AND ALUMNI NAMED MEMBERS OF THE ORDER OF CANADA

One of the country's highest civilian honours, investment in the Order recognizes outstanding achievement, dedication to the community and service to the nation.

Michael Sefton (ChemE, IBBME) is internationally recognized as a pioneer in biomedical engineering. Sefton has made significant contributions to research advances in biomaterials, biomedical engineering and regenerative medicine. He was one of the first to combine living cells with polymers, effectively launching the field now called tissue engineering. More recently, his lab has created biomaterials that actively promote the growth of blood vessels. By producing drug-like activity without any drugs or cells, these materials open a new world of possibilities for applications such as wound healing and the development of lab-grown tissues.

A leader in his professional community, Sefton served as president of the U.S. Society for Biomaterials in 2005 and has spearheaded several programs to advance the field, including the Toronto Tissue Engineering Initiative. He has worked with leading clinicians worldwide to advance research on health issues such as cancer and diabetes. From 1999 to 2005, Sefton was director of U of T's Institute of Biomaterials & Biomedical Engineering (IBBME), leading its development into one of the top institutes of its kind in North America. He currently serves as executive director of Medicine by Design, a U of T initiative that is accelerating discoveries in regenerative medicine to improve treatments for conditions such as heart failure, diabetes and stroke.

Sefton has received many distinguished awards in engineering and biomedicine, including the U.S. Society for Biomaterials Founders Award, the European Society for Biomaterials International Award, the Killam Prize in Engineering, the Engineers Canada Gold Medal, the Lifetime Achievement Award from the Tissue Engineering and Regenerative Medicine International Society and the Terumo Global Science Prize. He is a fellow of the Royal Society of Canada and an international member of the U.S. National Academy of Medicine.

Molly Shoichet's (ChemE, IBBME) multidisciplinary research is addressing some of the world's most pressing challenges in human health. As the Canada Research Chair in Tissue Engineering, Shoichet is pursuing solutions to a critical issue in medicine: treating damage to nerve tissues. Shoichet and her team design and implement novel strategies to promote tissue regeneration after traumatic spinal cord injury and stroke.

Her lab is known for its use of materials called hydrogels, which surround and protect stem cells when they are injected in the body. These hydrogels help stem cells survive and integrate into tissues, including tissue damaged by stroke, macular degeneration or other diseases. She has published more than 575 papers, patents and abstracts on tissue engineering and regenerative medicine.

She is the only person to be elected a fellow of all three of Canada's National Academies and is a foreign member of the U.S. National Academy of Engineering. In November 2017, Shoichet was named Ontario's first Chief Scientist, with a mandate to advance science and innovation in the province. Earlier this year she was awarded the 2017 Killam Prize in Engineering, Canada's most prestigious engineering award. She is also the recipient of the 2015 L'Oréal-UNESCO For Women in Science Award for North America and the 2013 Queen Elizabeth II Diamond Jubilee Medal. She has been a member of the Order of Ontario since 2011.

Outside of her own research, she is a passionate advocate for science and engineering and their important role in society. She has provided strategic advice to both the federal and provincial governments through her service on Canada's Science, Technology and Innovation Council and the Ontario Research Innovation Council.

In 2014, Shoichet was appointed U of T President Meric Gertler's Senior Advisor on Science and Engineering Engagement. She is the co-founder of Research 2 Reality, which uses digital media to shine a spotlight on the contributions academic researchers are making to the country. In 2015, she received the Fleming Medal and Citation from the Royal Canadian Institute in recognition of her outstanding contributions to science communication.

"Excellence is the hallmark of our U of T Engineering community. On behalf of our Faculty, my warmest congratulations to these distinguished alumni and faculty members. The Order of Canada is a richly deserved recognition of their visionary leadership in advancing engineering innovation and education in Canada."

—Dean **Cristina Amon**

George Myhal (IndE 7T8) was honoured for his achievements as an investment and finance leader, and for his philanthropic contributions, notably in support of innovation in engineering.

He is president and CEO of Partners Value Investments Inc. and was previously a senior managing partner and the chief operating officer of Brookfield Asset Management Inc. He has also served for more than a decade on the University of Toronto's Governing Council and the Faculty's Dean's Strategic Council. As an early supporter of U of T Engineering's Centre for Engineering Innovation & Entrepreneurship, now named for Myhal and his wife Rayla, his support was instrumental in building momentum for this dynamic new space.

Bert Wasmund (ChemE PhD 6T6), a world-renowned leader in metallurgical plant engineering and design, has served the Department of Chemical Engineering & Applied Chemistry and the Faculty with distinction for more than 25 years. As a generous philanthropist, Wasmund continues to support his alma mater through research initiatives and scholarships. Wasmund has also enabled many research partnerships between Hatch, a Canadian firm serving the global mining and metallurgical industry, and U of T, including the Hatch Industrial Research Chair in Electromagnetic Processing of Materials. Wasmund was inducted into the Engineering Alumni Network's Hall of Distinction in 2006.

Michael Sefton



Molly Shoichet



George Myhal



Bert Wasmund



FIRST TWO PHOTOS: BY NEIL TA THIRD PHOTO: COURTESY GEORGE MYHAL FOURTH PHOTO: BY SGT JOHANIE MAHEU

2017 ENGINEERING ALUMNI NETWORK (EAN) AWARDS

**Engineering Alumni
Hall of Distinction Award**

The EAN's highest honour, this award recognizes outstanding achievement, superior accomplishments and excellence in response to challenges.



Rocco Leonard Martino
(UTIAS PhD 5T6)

Dr. Rocco Martino is the inventor of the CyberFone—and the driving force behind the software systems permitting secure real-time video, voice and data linkages. While at the University of Toronto Institute for Aerospace Studies (UTIAS), he discovered the heating factors during the re-entry of space vehicles, which led to the heat shield developments that made space travel possible. He is the founder and chairman of the board of U.S. Robots, Inc. and was the founder, chairman and CEO of XRT, Inc., a global leader in treasury, cash and banking relationship management solutions. He served as professor of engineering and chair of the Systems Engineering Department of the University of Waterloo and as professor of mathematics at New York University. A visionary leader and philanthropist, Martino continues to create, dream and imagine possibilities through his writing and philanthropy.



Kathy Milsom
(CivE 8T3)

Kathy Milsom is the president and CEO of Toronto Community Housing. She is a member of the Board of Directors of the Greater Toronto Airports Authority, chair of the Advisory Board for Direct Construction Company Limited and chair of the Standards Council of Canada. Before focusing on board work, she held executive leadership roles at organizations such as the Technical Standards and Safety Authority, Canada Lands Company Limited, Vestar Facility Management, Vertical Markets and Johnson Controls World Services, Inc. Recently, she was also a senior fellow of the Canada School

of Public Service for its Crown corporation director orientation program. She received the EAN's 2T5 Mid-Career Achievement Award in 2008, a U of T Arbor Award for volunteerism in 2006 and the Professional Engineers of Ontario's Engineering Medal for Management in 2004.



Jonathan Rose
(EngSci 8T0, ECE MASC 8T2,
PhD 8T6)

Professor Jonathan Rose (ECE) has had a profound impact on both the academic research community and industry. He was instrumental in organizing a group of professors and graduate students to research field-programmable gate array (FPGA) technology, which ultimately led to U of T being recognized as one of the foremost academic institutions in the world for research in this area. He co-founded Right Track CAD Corporation, which developed novel FPGA device architecture and the computer-aided design software needed to design systems based on these devices. In 2000, Right Track was acquired by Altera Corporation—one of two dominant providers of FPGAs—and became part of the Altera Toronto Technology Centre. Rose served as the senior director of Altera Toronto Technology Centre until 2003.



Tom Siddon
(UTIAS MASC 6T6, PhD 6T9)

In his early career, The Honourable Tom Siddon split his time between teaching at UBC and growing his aero-acoustics engineering consulting firm. In 1976, his public service career began when he became city councillor for Richmond, B.C. He was successively elected in five federal elections between 1978 and 1993, and worked under several prime ministers in various cabinet roles. His appointment as Minister of Indian Affairs and Northern Development in 1990 led to what he considers his most significant achievement: the creation of Nunavut. After his federal career, he helped

develop a long-range water management plan for the Okanagan River Valley and even found time to serve on his local school board and also as a Regional District Director—a position he continues to hold today.

2T5 Mid-Career Achievement Award

Celebrates an individual who has earned respect within the profession and broader community and attained significant achievement within 25 years of graduation.



Tom Chau
(EngSci 9T2, ECE MASC 9T4)

A double graduate of U of T Engineering, Tom Chau is a leader, innovator and community champion. He is currently the vice-president of research at Holland Bloorview Kids Rehabilitation Hospital, director of the Bloorview Research Institute, the Raymond Chang Foundation Chair in Access Innovations and a full professor in the Institute of Biomaterials & Biomedical Engineering (IBBME) at the University of Toronto. From 2004 to 2014, he held a Canada Research Chair in Pediatric Rehabilitation Engineering. He was graduate coordinator of the Master of Health Science Program in Clinical Engineering from 2006 to 2011 and was the leader of the NSERC CREATE: Academic Rehabilitation Engineering doctoral training program from 2009 to 2015, both at the University of Toronto. Chau was named to the Order of Ontario in January 2018.

7T6 Early Career Award

Recognizes an individual who has become distinguished in their profession and community within 10 years of graduation.



Andrew Gillies
(MechE 0T7)

After Andrew Gillies graduated from U of T Engineering, he went on to obtain master's and PhD degrees in 2013 from the University of

California at Berkeley, working in Ron Fearing's Biomimetic Millisystems Lab. His research focused on developing controllable adhesives inspired by gecko footpads, with an emphasis on materials systems and microfabrication techniques. He received two NSERC post-graduate awards, published several scientific journal articles and filed numerous provisional patents. Shortly after graduating, he co-founded Dash Robotics, Inc. with the mission of creating affordable, educational STEM robots designed to inspire students to get involved in robotics and engineering. He regularly conducts workshops for at-risk middle school students in financially disadvantaged areas of Oakland.



Christopher Wilmer
(EngSci 0T7)

A leader in research, entrepreneurship and environmentalism, Wilmer is currently an assistant professor and principal investigator at the University of Pittsburgh's School of Engineering. His lab explores the properties of hypothetical materials using computer simulations. As a doctoral student at Northwestern University, he co-founded a materials company, NuMat Technologies, to bring his research to market. NuMat has won significant environmental prizes and private funding and is now a prospering company with over a dozen employees. In 2012, he was recognized by *Forbes* in its "30 Under 30 in Energy" list. He also co-founded the interdisciplinary graduate student think-tank The Earth Team, which addresses global poverty and climate change, and develops innovative solutions to address humanitarian, environmental and social problems.

**Malcolm F. McGrath Alumni
Achievement Award**

Named in honour of Malcolm McGrath on his retirement as assistant dean—alumni liaison, this award recognizes contributions of personal service to the Faculty, the

University or to the community. McGrath was the first assistant dean responsible for alumni affairs and development in the Faculty. Among his many accomplishments are the growth of the Annual Fund, the Engineering Open House, the introduction of the Skule™ Stage Band and the establishment of the Gratitude Campaign.



Don Andrew
(CivE 5T4)

Don Andrew founded Andrew Paving and Engineering Ltd. and served as president and CEO for its 55 years of operation. Over his long association with the Toronto and Area Road Builders Association (TARBA), he served as president three times, spent many years as chairman on the Labourer's Training School Board and became the association's first Honorary Lifetime Member. Andrew was active in the Engineering Society as an undergraduate, and as an alumnus he has served on Governing Council and the Engineering Alumni Network (formerly Engineering Alumni Association), first as a member and then as president. He has also been a loyal friend of the Department of Civil Engineering, leading fundraising initiatives for facilities improvements. Andrew's community involvement also extends to athletics. From 1980–1982, he was chairman of the Vanier Cup—the championship of Canadian university football.

L.E. (Ted) Jones Award of Distinction

Honours students who exemplify Professor Emeritus L.E. (Ted) Jones's great appreciation of the arts and his love of music.



Allan Kuan
(EngSci 1T4 + PEY, CivE PhD
Candidate)

For the past six years, pianist Allan Kuan has performed with the Appassionata Music Group, a student-run group that organizes classical music concerts on campus and throughout the community. He has also performed in collaboration with other musical

groups at U of T, including Open Score, Hart House Orchestra, the Innis College Choir and Skule™ Orchestra, with which he performed Sergei Rachmaninoff's "Piano Concerto No. 2 in C minor, Op. 18" in 2016. Outside of music, Kuan has devoted most of his efforts to teaching first-year engineering students, whose glowing reviews have led to his receipt of several awards, including the Spirit of EngSci Award in 2015 and the 2015–2016 Engineering Science Teaching Assistant Award.



Alex Perelgut
(EngSci 1T6 + PEY)

Alex Perelgut has been a cornerstone of the Skule™ Nite team for five years as a clarinetist, arranger, lyricist and band director and was the producer of Skule™ Nite 1T7. He has helped the Skule™ Orchestra flourish since 2012 by acting as a performer, external relations officer and financial director. Academically, Perelgut is an honours student and has built a strong record of professional experience, including a Professional Experience Year (PEY) internship at ZS Associates, and summer work terms at RBC and with Professor **Ted Sargent's** (ECE) research group at U of T. He has also been involved in extracurricular efforts such as the NSight mentorship program and has served as an Engineering Science Ambassador.

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Our dynamic and engaged global engineering community—alumni, friends, faculty, staff, students and industry partners—plays an important role in our position as the top-ranked engineering school in Canada and one of the world’s best. Continued support enables today’s scholars and tomorrow’s engineering leaders to build a global society of boundless innovation, creativity and economic prosperity.

We offer our deepest thanks for your tremendous support and dedication.

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The following donors have made new gifts and pledges to the Faculty of \$25,000 or more between May 1, 2016 and April 30, 2017.

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In September 2016, a landmark \$20-million bequest from the estate of alumnus **Erwin Edward Hart** (CivE 4T0) provided substantial support for research and education at U of T Engineering. The Faculty established the Percy Edward Hart and Erwin Edward Hart Professorships, awarded to outstanding early-career researchers; and the Hart Teaching Innovation Professorships, which support pioneering engineering educators.

“This gift deepens our Faculty’s culture of research and teaching excellence,” says Dean **Cristina Amon**. “It also strengthens the Faculty’s ability to recruit top early-career educators and researchers from around the world. Our students will benefit by working with faculty members who are deeply devoted to mentoring the next generation of innovators.”

The professorships are one element of a rich suite of initiatives focused on enhancing engineering education across the Faculty and within the profession more broadly, including workshops on educational technology and conferences that bring together thought leaders in the field from across Canada and beyond.

ILLUSTRATION: BY ANDREA M. LISTRO

Honour Roll

LEGACY GIFTS

Planned gifts help fund the work of our students, scholars and researchers through bequests, insurance gifts, trust agreements and charitable annuities. As of April 30, 2017, the following alumni and friends have thoughtfully made a provision for the University in their estate plans or as Annual Fund gifts.

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In 2016–2017, Skule™ Society donors made contributions amounting to \$644,186, which represents 60 per cent of all annual giving to the Faculty. These gifts of between \$1,000 and \$25,000 enhance our research and educational programs in many ways, from improvements to labs and classrooms to scholarships and funds for student co-curricular activities.

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The following faculty and staff members have generously shown their commitment to the Faculty not only through dedicated service, but also with financial contributions. Donors listed below made gifts or pledges to the Faculty between May 1, 2016 and June 1, 2017.

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Setting a new benchmark for student leadership

By **Jamie Hunter**



When **Mauricio Curbelo** (CivE 1T4) was a second-year student in 2011, he helped lay the groundwork for one of the largest donations in Engineering Society (EngSoc) history—he just didn't know it at the time.

That year, as EngSoc's vice-president, external, Curbelo was part of a team that established the Skule™ Endowment Fund, generated by annual student contributions of \$100 and intended to finance a variety of student-related initiatives.

It was this same fund that EngSoc drew from in 2013, with Curbelo

as president, to donate \$1 million to the Myhal Centre for Engineering Innovation & Entrepreneurship, providing a dedicated space for student clubs to socialize, hold events and collaborate on group projects.

"It was never really a question as to whether EngSoc would contribute toward the Myhal Centre," Curbelo says. "We had the money [in the Skule™ Endowment Fund] and that's what it was intended for. We thought it was a great opportunity to make a contribution, have a seat at the table, top up the project

1 **Alumnus Mauricio Curbelo says that his time as EngSoc president laid the foundation for key professional competencies.**

support and put the student space issue on the map."

U of T Engineering student clubs and design teams are some of the best in the world—including the Super-mileage Team that designs, fabricates and races hyper-fuel-efficient prototype vehicles; the University of Toronto Aerospace Team that builds and flies aircraft, satellites and rockets; and the Human-Powered Vehicles Design Team that won the 2017 World Human Powered Speed Challenge. The Myhal Centre's lower level will be home to many teams and clubs. With flexible meet/work spaces, immediate access to fabrication facilities as well as a place to host events, this space will be a game-changer for student groups.

"The one thing that students asked for most when we ran our clubs was storage space," Curbelo says. "It makes sense because most clubs are not designed to be huge—they're just small interest groups—and chances are they have supplies and a bunch of equipment they have to carry around. It makes a big difference to have one small locker somewhere on campus where they can keep that stuff. It makes it easier for those people to be involved and to balance school with extra-curricular activities."

Since graduating, Curbelo has worked in the ready-mix concrete industry, first in the quality-control function at Lafarge in Toronto, and now in plant production and maintenance at Lehigh Hanson in Vancouver. The pay-it-forward generosity of EngSoc's donation brings gratification to the recent alumnus.

"When EngSoc was discussing the donation, not one person ever questioned: Why would we give if we won't enjoy it? It was never a consideration for anyone," he says. "I think the more that you do outside of the classroom, the more you see the significance of alumni donations and their generosity. We all understood the impact alumni had on us when we were in school so we were happy to give back." ☐



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INDI GOPINATHAN (CivE 9T6)
Consultant, Mining
Adjunct Professor, U of T Engineering





UNIVERSITY OF TORONTO
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Land Acknowledgement

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.

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