MISSISSAUGA / ST.GEORGE / SCARBOROUGH

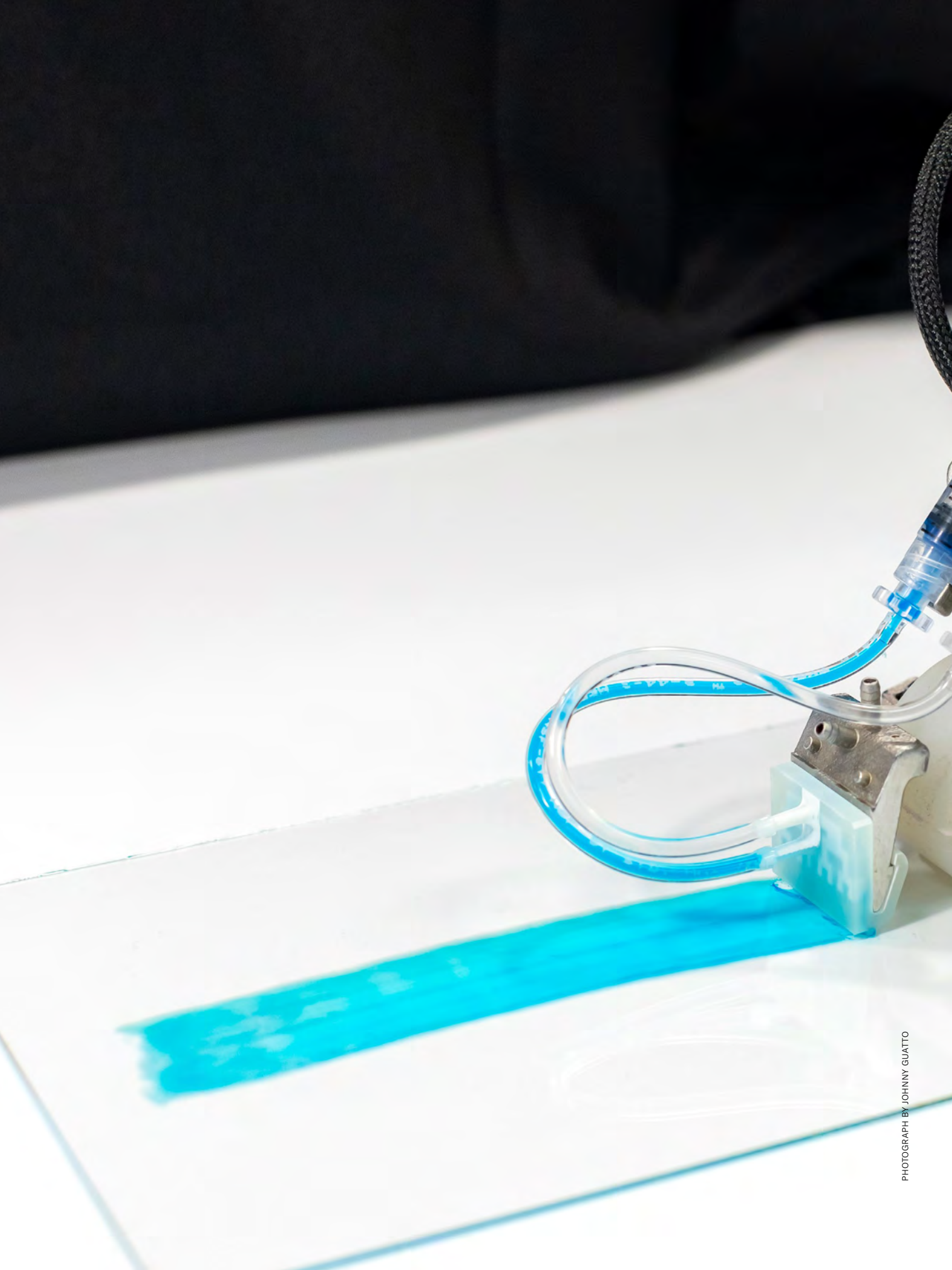
University of Toronto MAGAZINE

THE MIRACLE OF INSULIN

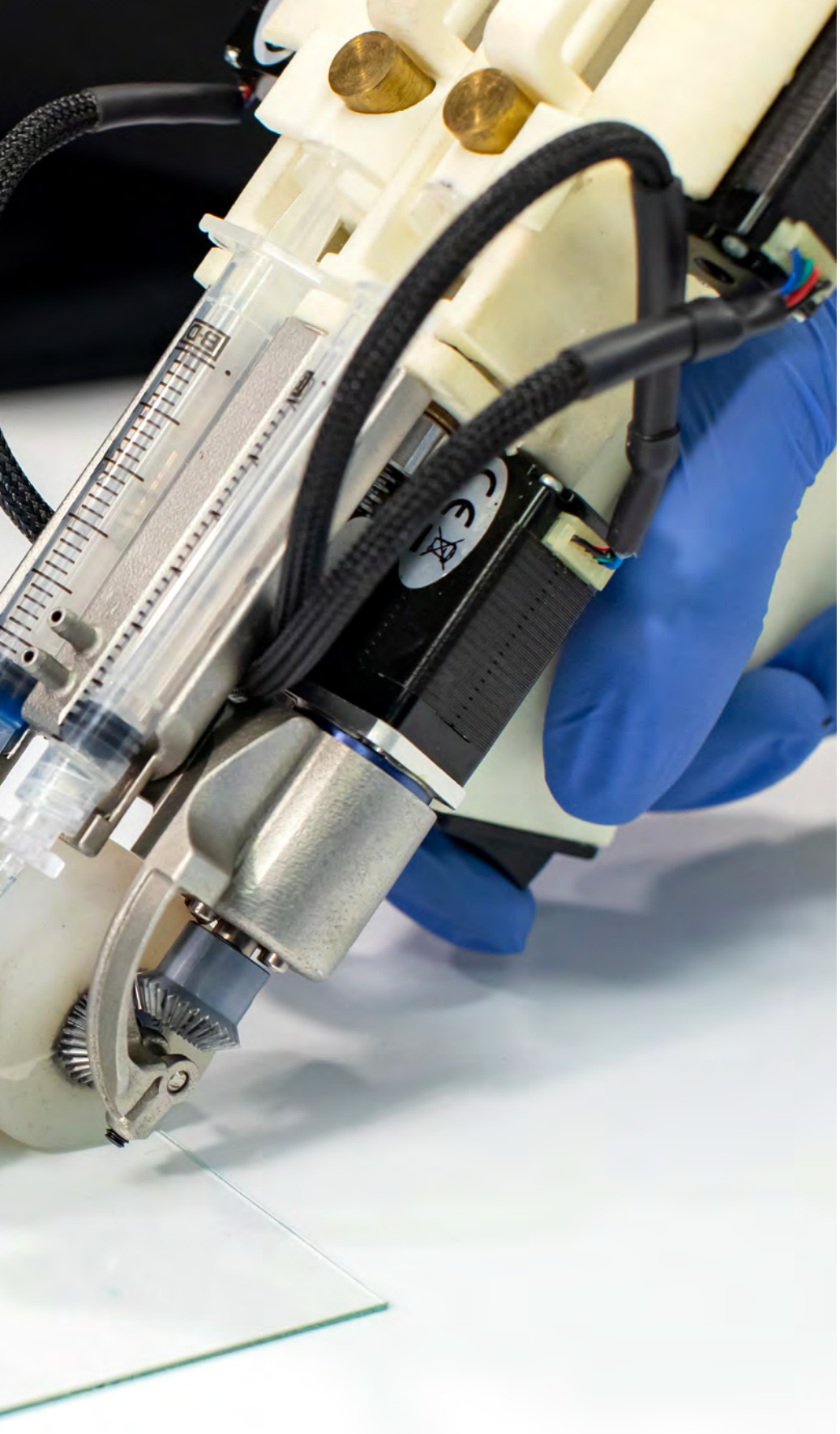
The U of T discovery a century ago has saved countless lives. Today, even better treatments for diabetes are on the way

Autumn 2021

PLUS: FOOD SECURITY IN CANADA'S FAR NORTH — GOLDFISH GONE WILD — DECODING HOW MEMORY WORKS — A BETTER WAY TO ANSWER CRISIS CALLS — SKULE NITE'S DEBUT — BIG CITY BEES



PHOTOGRAPH BY JOHNNY GUATTO



SECOND SKIN

DATE: AUGUST 30
TIME: 10:21 A.M.
CAMPUS: ST. GEORGE

This surgical tool, being developed by researchers at U of T and Sunnybrook Health Sciences Centre, could soon change how large burn wounds are treated.

The device – a kind of 3D printer for skin – will enable physicians to lay a sheet of biomaterial over a patient's burn site and dispense a "bio-ink" to accelerate the healing process. The bio-ink, a solution containing mesenchymal stromal cells (a kind of stem cell), promotes skin regeneration.

Burns are currently treated with skin grafting, which involves transplanting healthy skin from other parts of the body onto the wound. This poses a problem when burns cover a large portion of the body. "With big burns, you don't have sufficient healthy skin available, which can lead to patient deaths," says Marc Jeschke, the director of the Ross Tilley Burn Centre at Sunnybrook and the project's clinical collaborator. "A device like this could change the entirety of how we practise burn and trauma care."

Since 2018, the printer has gone through a full redesign to allow physicians to treat a broader range of wound sizes and shapes, says Prof. Axel Guenther, whose engineering lab is leading the U of T side of the project. Guenther envisions surgeons being able to use the device in operating rooms in the next few years. **—Liz Do**

THE NEXT LEVEL

DATE: AUGUST 25
TIME: 8:11 A.M.
CAMPUS: MISSISSAUGA

The U of T Mississauga Library is now home to one of Canada's largest video game collections.

Earlier this year, the library acquired the Syd Bolton Collection, a vast array of more than 14,000 video games, consoles and related materials such as instruction manuals and about 5,000 issues of specialty magazines. Bolton, who described himself as Canada's top video game collector, was the founder and curator of the Personal Computer Museum in Brantford, Ontario. He died in 2018 at the age of 46.

Assembled privately over the past 30 years, the bulk of the collection contains games and hardware from the 1970s onward. It includes some of the first commercial home video consoles such as Odyssey and Atari, a complete run of games on Nintendo 64 and Sony PlayStation, and several classic arcade machines, including Pac-Man. The archive also contains a copy of one of the rarest Atari 2600 games in existence: *Extra Terrestrials* (not to be confused with Atari's failed movie-licensed game, *E.T. the Extra Terrestrial*). Here, librarian Christopher Young tests Tetris on an '80s-era Nintendo console.

The Bolton Collection will be made available to the university community and the general public through the UTM Library, and will provide opportunities for experiential teaching, game-related research and community engagement.

—Patricia Lonergan

PHOTOGRAPH BY NICK IVANYSHYN

THE LIFE AQUATIC

DATE: AUGUST 18
TIME: 10:16 A.M.
CAMPUS: SCARBOROUGH

A new underwater drone equipped with a high-definition camera will give U of T Scarborough students an up-close look of what's living beneath the surface of Ontario's lakes.

The teaching tool will be used by undergraduate and master's students supervised by Mathew Wells, a professor in the department of physical and environmental sciences. Here, staff members Chai Chen and Tom Meulendyk use the pool at the Toronto Pan Am Sports Centre to test the device for the first time.

The drone, which received funding from UTSC's Centre for Teaching and Learning, can reach a depth of 75 metres – good for most bodies of water in the province and far deeper than a scuba diver can go. It's tethered by a long cable and controlled by a remote with a digital screen. It's also outfitted with bright LED lights and can record panorama video, offering an immersive view of fresh-water wildlife that can't be replicated in a textbook.

"We are spoiled by the quantity and quality of fresh water we have in Canada, but most of us have no idea what the bottom of our lakes look like," says Wells. "By visualizing what's going on underneath the surface, maybe we can better appreciate our bodies of water."
—Don Campbell

PHOTOGRAPH BY DON CAMPBELL

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As a student, Ernest Nyarko says he was able to describe some of Ghana's "non-Western realities" to his peers: "I made a point of sharing my experiences growing up," p. 27

PHOTOGRAPH BY JORIAN CHARLTON

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Prof. Keisuke Fukuda decodes how memory works, p. 44

"I was tired of feeling like I had to prove myself over and over again," p. 52

ON THE COVER

Illustrator Andrea Ucini conveys how insulin has transformed the treatment of diabetes, enabling patients to lead long and active lives. Today, even better therapies are in development (see p. 18).

PHOTOGRAPHS BY (FAR LEFT) KATE DOCKERAY; (TOP) ENZO RODRIGUEZ

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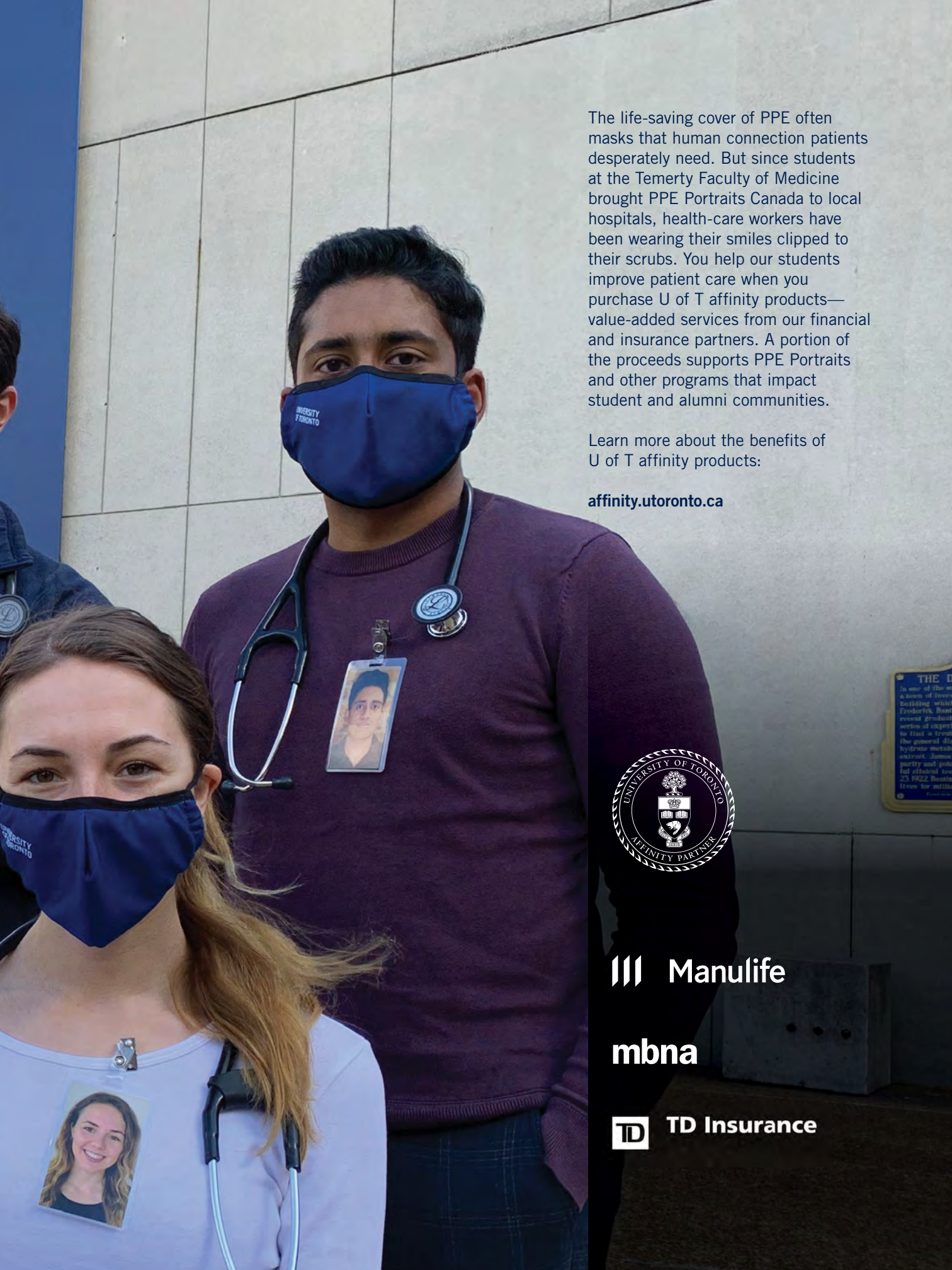
A SMILING FACE WHEN PATIENTS NEED IT MOST



The life-saving cover of PPE often masks that human connection patients desperately need. But since students at the Temerty Faculty of Medicine brought PPE Portraits Canada to local hospitals, health-care workers have been wearing their smiles clipped to their scrubs. You help our students improve patient care when you purchase U of T affinity products—value-added services from our financial and insurance partners. A portion of the proceeds supports PPE Portraits and other programs that impact student and alumni communities.

Learn more about the benefits of U of T affinity products:

affinity.utoronto.ca

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Many doors to exciting opportunities are shut to people with disabilities. The students you profiled are true champions. I wish more organizations would acknowledge these profound successes.

JENNIFER ANGUS, BA 1994 INNIS,
WHISTLER, B.C.

The Benefits of Inclusivity

Our Spring 2021 cover story featured students Alex Lu and Emily Chan, who have disabilities, and explored how the university is working to improve accessibility on its three campuses.

It is good to learn that the definition of "disability" is widening. My son has been ill with an autoimmune disease that causes debilitating pain from time to time but is mostly invisible to those outside his family. When he was in high school, we fought constantly for him to have extra time to complete exams, tests and assignments because of his disease. Now at U of T, he is having a great year with classes online. If he has to miss a class because of illness, he can watch it and catch up. I hope this will continue even after going back to in-person lectures.
MARIA RIEDSTRA, BEd 2007 OISE,
TORONTO

I was registered with accessibility services throughout my university years. As a survivor of an acquired brain injury, accommodations such as extra time on tests and peer note-takers were integral to my success. Congrats to U of T for continuing to develop accessibility services and for creating opportunities for students who otherwise face substantial obstacles.
DAVID SULLY, BA 2007
WOODSWORTH, TORONTO

As much as I appreciated this article, I cannot help but notice that there are no representations of Black bodies who must negotiate this system. As a person with a disability, I have yet to receive a warm reception in this space. This is not to say I am not happy for those who do get acknowledgment; it's good to know that the system works for some of us. I'm just not sure it works for all of us.
CARLA RODNEY, BA 2017
UNIVERSITY COLLEGE, TORONTO

Dealing with Disinformation

"The Extremism Machine," from our spring issue, examined how online disinformation radicalizes people. It also explored practical solutions to the problem.

The way to deal with disinformation is not to deplatform people. Deplatforming enrages and entrenches people. The solution to disinformation is open debate. This is the Canadian way. Laws are not passed without parliamentary debates; criminals are not convicted without a chance to defend themselves; and scientific papers are not published till they have been peer-reviewed. Even religious organizations such as the Christian church have a long history of calling councils to debate issues. Of course, debates do not always end up supporting the truth, for people are only human. Furthermore, not every individual is won to the side of the majority. But open debate remains our best avenue to stop

disinformation. Sadly, how rare it is for two opposing sides to meet publicly and discuss an issue rationally.
THOMAS VERDUYN, BASc 1990, CARMAN, MANITOBA

"Fighting" disinformation is not necessary if we confer critical-thinking skills on our youth through education. Any university that has graduated people who believe and spread disinformation needs to be asking and answering, "Why and how are we failing?" But, as we well know, the process needs to start in youth.
LESLIE WARREN, BA 1982 WOODSWORTH, BARRIE, ONTARIO

Two articles by Lee McIntyre regarding his book *Post-Truth*, from the MIT Essential Knowledge Series, discuss cognitive dissonance and the difficulty of negating a lie. Using the idea of an ecosystem is good. This is not just a single problem, but a social one that must be handled on a broad front.
DICK SWENSON, WALLA WALLA, WASHINGTON

Action on Carbon

"Clearing the Air," from our spring issue, explained the university's plan to reduce its carbon footprint to "net zero" by 2050.

While I applaud the strategies endorsed at U of T to address the challenge of climate change, I was disappointed by one thing: 2050 is far too far away. Organizations that make claims about 2040 or 2050 are missing the dire urgency of the situation.
SHABBIR ALIBHAI, MD 1993, MSc 2001, RICHMOND HILL, ONTARIO

Ron Saporta, chief operating officer for property services and sustainability at St. George, responds:
By the end of this decade, the University of Toronto will cut its greenhouse gas emissions to less than half of 2005 levels. Under our 2050 "climate-positive" plan, we will eliminate fossil fuels as a primary source of energy and generate our own offsite renewable energy. U of T recognizes that climate change is an urgent problem. We are moving as fast as our infrastructure, operations and finances will allow, and we will aim to meet our targets sooner if we can.

Rapper's Delight

Great article about how U of T Scarborough prof Mark V. Campbell is preserving Canadian hip hop culture for future generations. – @SesayArts

The Robot Will See You Now

In our spring issue, we profiled Prof. Jessica Burgner-Kahrs' research into slender robots that could one day be used in surgery and other applications.

This is brilliant! May I suggest a combination of two devices (like a surgeon's two hands)? One robot could probe a tumour with a hot or cold or mechanical knife and the second could suction the debris. There are many possible iterations.
MIKE BELL, MD 1969, LANSDOWNE, ONTARIO

Write to us

University of Toronto Magazine welcomes comments at uoft.magazine@utoronto.ca. All comments may be edited for clarity, civility and length.

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UNIVERSITY OF TORONTO

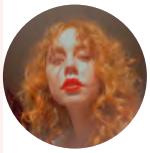
GOLDFISH GONE WILD

Photographer Cole Burston goes fishing sometimes, but he had never seen anything quite like the massive goldfish inhabiting a stormwater pond next to a housing subdivision in Ancaster, Ontario. "As pets, they're cute. But these monstrosities are bigger than a human hand," he says.

These oversized goldfish — or their ancestors — were probably once pets, says Nick Mandrak, a UTSC biology professor who's studying what happens after owners release them into the wild. Burston says the fish he saw seemed bloated and unhealthy. "I wouldn't want to catch one."

Read about goldfish "super-invaders," p. 48; see more photos at our website

↑ Goldfish like this are thriving in ponds across southern Ontario



Photographer **KATE DOCKERAY** says she likes to flout the rules of photography to get an interesting or unusual shot. For her portrait of Keisuke Fukuda, an assistant professor of psychology at U of T Mississauga who studies memory (page 44), she played with lighting to create the sense of a fading recollection. A graduate of Sheridan College, Dockeray launched her career shooting album covers and photos for local musicians – which, she says, is still her favourite kind of assignment. Her clients include *Report on Business Magazine* and *Maclean's*.

NICKITA LONGMAN is a freelance writer from George Gordon First Nation in Treaty 4 Territory who often covers Indigenous issues. For our story about Tracey Galloway, an anthropology professor who researches food insecurity in Canada's Far North (page 32), Longman spoke with members of the Inuit community in Arviat, Nunavut, as they prepared to harvest traditional food before winter. Longman says she was heartened that both they and Galloway agree that the solution to food insecurity in the north ultimately lies with Indigenous peoples themselves.

Recounting how U of T alumni Asante Haughton and Rachel Bromberg created the Reach Out Response Network (page 39) gave writer **ANDREA YU** hope that big changes can happen in how society treats people experiencing a mental health crisis. "Haughton and Bromberg faced skepticism and doubt when they first advocated for an alternative to having police respond to mental health crisis calls," she says. "But their idea will soon be piloted by the City of Toronto, proving that change is possible." Yu also writes for the *Globe and Mail* and *Toronto Life*.

Want to contribute? Send your ideas to scott.anderson@utoronto.ca.

PHOTOGRAPH BY (GOLDFISH) COLE BURSTON; ILLUSTRATION BY STUDIO WYSE

U OF T MISSISSAUGA

NEW SCIENCE BUILDING WILL USE MINIMAL ENERGY

One of the most energy-efficient science buildings in the world is under construction at U of T Mississauga, with completion scheduled in 2023.

The five-level facility will house the Centre for Medicinal Chemistry, the departments of biology and chemical and physical sciences, as well as the forensic science program. It will include 29 laboratories and a high-performance computing data centre. The labs, which were planned with input from UTM researchers, are designed for collaboration and the sharing of specialized equipment.

The project will contribute to UTM's ongoing efforts to lower its net carbon emissions to zero by mid-century. The Science Building is expected to use 65 per cent less energy than a conventional building. For most of its heating and cooling, it will use geothermal technology and rooftop solar photovoltaic panels. Interior features include LED lighting throughout and, in labs, fume hoods that require less energy to operate.

ST. GEORGE

ENGINEERING STUDENTS PLACE FIRST IN SELF-DRIVING VEHICLE CONTEST

A team of U of T students participating in the international AutoDrive Challenge placed first in a virtual competition to demonstrate the capabilities of its self-driving electric vehicle. It's the fourth year in a row that the team has come out on top.

The group includes more than 70 undergraduate and graduate students, mostly from the Faculty of Applied Science and Engineering.

Together, the students retrofitted a Chevrolet Bolt with a suite of sensors, including cameras, radar and lidar. (Lidar uses laser light to detect objects around the vehicle.) Additional hardware and student-designed software inside the car process the signals and convert them into commands that enable the car to drive itself safely.

This year, the U.S.-based teams met in Michigan; the Canadian teams competed online with presentations and video demos.

The U of T team is already working on the SAE AutoDrive Challenge II, which was to begin this fall and involve 10 North American universities.

U OF T SCARBOROUGH

NEW ACADEMY OF MEDICINE SCHEDULED TO OPEN IN 2024

Plans are underway to create a new academy of medicine to help train health-care professionals in the eastern Toronto region.

The Scarborough Academy of Medicine and Integrated Health is a partnership with U of T's Temerty Faculty of Medicine, Lawrence S. Bloomberg Faculty of Nursing, local hospitals and health networks, and an expanded life sciences program at UTSC. It will be the first medical academy located in the eastern Toronto region and will seek to help fill a shortage of trained health-care professionals living in the region.

Once fully operational, the academy will have the capacity to graduate up to 50 doctors, 30 physical therapy students and 300 life sciences undergraduates a year. It will also bring onto campus 30 nurse practitioner students and 30 physician assistant students a year. It is anticipated the academy will open for the 2024-25 academic year.

TOWARD A SUSTAINABLE FUTURE

Later this autumn, decision-makers from around the world will gather in Glasgow for the next United Nations Climate Change Conference. Their goal is to ensure fulfilment of the Paris Agreement – to achieve a net-zero increase in greenhouse gas emissions by 2050 in order to limit global warming, preferably to no more than 1.5 degrees Celsius above pre-industrial levels. The need to do so could not be more urgent.

Our alumni and friends can take pride in the fact that the University of Toronto continues to set an example by doing our part, as Canada's leading institution of higher education and advanced research. This tri-campus, interdisciplinary effort is being co-ordinated by the President's Advisory Committee on the Environment, Climate Change, and Sustainability, co-chaired by Professor John Robinson and Ron Saporta, chief operating officer, property services and sustainability (St. George campus).

Our students are encouraged to become leaders in the field by following the pathways identified in our searchable databases of U of T's huge range of sustainability-related courses, community-engaged learning opportunities and co-curricular activities. They have also undertaken more than 200 "living lab" sustainability projects, both on and off campus.

On the research front, the percentage of U of T scholarly publications touching on the UN's Sustainable Development Goals has increased remarkably in recent years. In 2018, our scholars produced more such papers than those of any other university in the world, after Harvard.

U of T is also providing outstanding leadership through our operations, investments and external relations. Once again this year, U of T is one of Canada's Greenest Employers. We are steadily implementing our Low-Carbon Action Plan, to reach our 2030 tri-campus emissions reduction target of 37 per cent below 1990 levels. And our St. George campus has committed to becoming climate-positive by 2050, meaning it will be a net "sink" of greenhouse gases.

The University of Toronto Asset Management Corporation (UTAM) has reduced the carbon footprint of our pension and endowment assets by 37 per cent (as of December 31, 2020). As UTAM approaches its initial decarbonization target of 40 per cent well ahead of schedule, it will soon identify even more ambitious goals.

Since climate change also requires multilateral action, U of T is a founding member of the U7+ Alliance of World Universities, a global coalition of university presidents, and the University Climate Change Coalition, a group of leading North American research universities. U of T is also a key participant in the Green Will Initiative, to support the City of Toronto in reaching its own emissions target.

Climate change will impact the world profoundly for centuries to come. The good news is that we can still take decisive action, if we work together. And, while much remains to be done, the U of T community is helping to show the way.

MERIC GERTLER

PHOTOGRAPH BY LISA SAKULENSKY

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A reimagined UC Library, both storied and state-of-the-art, has reclaimed its rightful place in UC's beloved East Hall. Part of the University College Revitalization Project, the library is now ready for our students' return to campus. Legacy giving helped make it all possible. When you include a bequest to U of T in your will to support the University's greatest needs, you give us the flexibility to fund initiatives like the UC Library. So students can make the most of their U of T experience.

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UNIVERSITY OF TORONTO

BY
MARCIA KAYE

the miracle of insulin

Illustration
by Andrea Ucini

A CENTURY AFTER U OF T SCIENTISTS DISCOVERED THE LIFE-SAVING EXTRACT, RESEARCHERS ARE FINDING NEW WAYS TO IMPROVE THE LIVES OF PEOPLE WITH DIABETES

It has been 44 years

since Ana Osborne passed out one morning before school and woke up four hours later, bewildered. After dragging herself to the doctor and being ordered to get to a hospital immediately, the 18-year-old was diagnosed with Type 1 diabetes and told that her very survival would depend on frequent injections of life-saving insulin. An early routine involved poking her finger with a lancet, putting a drop of blood on a test strip to check her blood sugar level, and then using a syringe to inject insulin derived from a pig's pancreas into the skin of her abdomen – multiple times a day. She has since tried so many different insulin types, tools and devices that her experience has almost mirrored the evolution of insulin therapy itself.

And today? Osborne wears a small disk-shaped sensor on her shoulder called a continuous glucose monitor. She uses a handheld device to read those numbers and she relays the information to a palm-sized computerized pump at her waist that delivers rapid-acting synthetic insulin under her skin via a tiny needle. "It's much better than the older systems," she says, acknowledging that even the best equipment is still a treatment, not a cure.

U of T researchers and their hospital partners recognize this as well, and are working on novel approaches to diabetes care that continue to improve lives for patients – building on something their predecessors started a century ago with the discovery of insulin. And for that, Osborne, who lives just north of Toronto, is deeply grateful. "If not for them," she says, "I wouldn't be here talking to you today."

Back in 1921, Type 1 diabetes – once called juvenile diabetes – was a death sentence for the children and youth who developed it. There was no known cause, and the only treatment was a starvation diet that extended life by a few months. Into this reality came an ambitious young doctor named Frederick Banting, a farmer's son from Alliston, Ontario. The youngest of five, he had struggled in school, flunking his first year of a general arts program at U of T's Victoria College. Still, young Fred was serious and driven, and since the country was in dire need of doctors, he was accepted into medical school. After graduating, he served as a medical officer in England and France during the First World War. When he returned to Canada, he took a year of surgical training at Toronto's Hospital for Sick Children. Then, unable to find a full-time staff job, he opened a small medical practice in London, Ontario. The patients were slow to arrive. Banting's practice faltered, and he fell into debt. He picked up part-time work teaching at the University of Western Ontario (now Western University) but still could not pay his bills.

It was around this time, while preparing a lecture for medical students about the pancreas, that Banting decided to pursue a middle-of-the-night idea he'd had about curing diabetes. With no laboratory available at Western, he persuaded a reluctant John

PHOTOGRAPHS (BANTING AND BEST) COURTESY OF UNIVERSITY OF TORONTO LIBRARY; (INSULIN AND FARRELL) COURTESY OF SANOFI PASTEUR CANADA, CONNAUGHT CAMPUS ARCHIVE; (PETERS) COURTESY OF U OF T ARCHIVES

IGNITING A CENTURY OF DISCOVERY

U of T and its partner hospitals have built a culture of innovation that has brought about major advances in health care. Here are some of the most important discoveries made by doctors and scientists affiliated with U of T in the past 100 years.

1921

Frederick Banting and Charles Best discover insulin

1925

The discovery of insulin spurs growth in Connaught Laboratories and public health education, leading to the creation of U of T's School of Hygiene

1943

Leone Farrell's research makes possible the large-scale production of the polio vaccine

Macleod, a professor of physiology at U of T and an expert in carbohydrate metabolism, to give him lab space over the summer of 1921, along with a research assistant. The assistant turned out to be Charles Best, 22, newly graduated from U of T in biochemistry and physiology. Banting closed his medical practice and moved to Toronto. As he and Best conducted experiments under Macleod's direction, they realized Banting's hypothesis about curing diabetes didn't work. They did discover, however, that injecting diabetic dogs with an extract made from the animals' own surgically removed pancreases dramatically lowered the animals' blood sugar levels. Aha! They knew they were on to something. They just didn't know how to purify this extract to make it safe for human clinical trials.

Macleod invited University of Alberta biochemist James Collip, who had returned to his alma mater, U of T, for a sabbatical, to work on the purification process. Within weeks, using the pancreases of cattle from slaughterhouses, Collip figured out a way to purify the extract – now called insulin – by using a high concentration of alcohol.

Days later, the first recipient of an injection was Leonard Thompson, a 14-year-old patient at Toronto General Hospital weighing only 65 pounds and close to death. The boy responded quickly and recovered well. When the dying teenage daughter of then U.S. Secretary of State Charles Hughes rebounded to rosy-cheeked health after insulin treatment in Toronto, the international press went wild. Banting became a celebrity. He and Macleod received the Nobel Prize just one year later. Banting, upset that Best had been passed over, split the prize money with his young assistant. Macleod did the same with Collip. The team sold the patent to U of T for a dollar, and the university then licensed it royalty-free to pharmaceutical companies around the globe. By the summer of 1923, U of T's Connaught Laboratories was producing 250,000 units of insulin a week for use in Canada and internationally. As Banting said, "Insulin belongs to the world, not to me."

DIABETES IN CANADA

Almost one in three Canadians is living with a form of diabetes, or with prediabetes

Diabetes contributes to heart attacks, strokes, kidney failure, the majority of non-traumatic leg and foot amputations, as well as most blindness in working-age Canadians

In addition to the enormous burden it places on individuals and families, diabetes costs the health care system almost $30 billion a year

Now, after 100 years, the world needs insulin more than ever. Almost half a billion people worldwide live with Type 1 or Type 2 diabetes – a number expected to soar over the next decade due primarily to rising rates of obesity. And while it's no longer imminently fatal, the disease still kills approximately 1.6 million people every year. Researchers continue to focus on ways to improve – and save – patients' lives. "There have been, and continue to be, tremendous advances that have positively impacted the lives of people with diabetes," says Gary Lewis, director of U of T's Banting and Best Diabetes Centre and a senior scientist at the Toronto General Hospital Research Institute. While there is still no cure, he says U of T researchers and their hospital partners are getting closer all the time. "One kind of cure [for Type 1 diabetes] could come in the form of stem cell therapy, another in immune therapy."

In Type 1 diabetes, an autoimmune disease usually acquired in childhood or adolescence, the immune system mistakenly kills the body's beta cells, which produce insulin – the hormone that regulates our blood sugar levels. In Type 2 diabetes, the body either doesn't produce enough insulin or can't use it properly.

You might think that a transplant, of either an entire pancreas or just the islets (clusters of cells

1951
Wilfred Bigelow develops the first electronic heart pacemaker

1961
James Till and Ernest McCulloch discover the blood-forming stem cell, which becomes the basis for regenerative medicine

1975
Vera Peters revolutionizes the way we approach cancer treatment by showing that treating early-stage breast cancer with lumpectomy and radiation is just as effective as radical mastectomy

1981
David Jenkins develops the Glycemic Index, which enables people to manage their blood sugar level through diet

within the pancreas that include beta cells), would be an answer to curing Type 1 diabetes. But there are problems: there is always a shortage of donors; islet transplant requires two or three donors because many cells are damaged in the process; and recipients must take immune-suppressing drugs for life. These drugs carry risks of cancers and infections.

But what if we could find an unlimited source of islets that would also eliminate the need to take immune-suppressing drugs? One U of T team in the field of regenerative medicine is working on exactly that. Under Cristina Nostro, principal investigator at the McEwan Stem Cell Institute at the University Health Network, researchers start with pluripotent stem cells (informally known as cells that can "be whatever they want when they grow up"). Scientists can take these cells, and with the addition of various proteins, instruct them to behave like islet cells. The problem: if your body attacked your own islet cells (which include beta cells) before, it will attack these cells, too. A research group at the University of Washington Seattle is collaborating with Nostro on making these cells invisible to the immune system, she says. "Then we could transplant without the need of immune suppressants."

The Washington team is taking three approaches to achieve "invisibility." Meanwhile, Nostro's team is working to demonstrate that these "instructed" islet cells *actually* function like islet cells and will not be rejected by the immune system. With patents filed and strong connections forged with Toronto General Hospital (and its ready supply of patients and surgical expertise), Nostro, also a professor in the department of physiology, is hoping to one day launch a clinical trial in Toronto. "I'm super excited," she says. "The progress we've made is extraordinary."

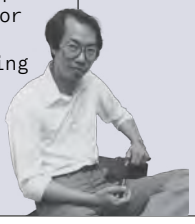
Another U of T team is working on tricking the immune system by manipulating T-cells, a type of white blood cell that, in Type 1 diabetes, mistakenly attacks healthy islet cells. Under Juan Carlos Zúñiga-Pflücker, a professor in U of T's department of immunology and a senior scientist at Sunnybrook Health Sciences Centre, the team is using a specific protein to convert the misdirected T-cells into regulatory T-cells, which suppress the immune system and can prevent autoimmune disease. Zúñiga-Pflücker has co-founded a company, Notch Therapeutics, to bring this technology to market. "If you measure antibodies, which can identify children and young adults who haven't yet developed diabetes but who are at high risk, modulating the immune system can prevent the total destruction of those cells and prolong their function," Lewis says.

Other U of T research teams are focusing on Type 2 diabetes, which is much more common than Type 1, and much more closely linked to lifestyle. "There's no question that if we solve the problem of obesity, we can solve most of the problem of Type 2 diabetes," says Lewis. But obesity is a complex global epidemic that involves far more than simply choosing to eat too much or exercise too little. It's partly genetic: Asian, Black, Hispanic/Latino and Indigenous populations have a higher risk of obesity and diabetes. It's partly biological, with our natural human attraction to fatty and sweet tastes and our evolutionary ability to store fat. It's partly our modern society, which necessitates sedentary, screen-based work or school. And it's partly the social determinants of health: socioeconomic inequalities leave disadvantaged people without access to nutritious food, recreation opportunities, medical specialists or healthy outlets to manage stress. Lewis says, "In Type 2 diabetes, the social determinants of health totally swamp the genetic and biological determinants." And they are affecting younger people. An alarming 2020 Manitoba government study found that the rate of Type 2 diabetes among children in Indigenous communities in that province is 25 times higher than that of other children.

The link between stress and diet has been a particular research interest of Jacqueline Beaudry, an

STORY CONTINUES P. 24

1984
Tak Mak helps to identify the T-cell receptor gene, a major advance in understanding the body's immune system



1986
Dan Drucker identifies the role of gut hormone GLP-1 in control of insulin secretion, eventually leading to new drugs to treat diabetes

1988
Alan Hudson and Susan Mackinnon perform the first nerve transplant

1994
John Dick identifies cancer stem cells

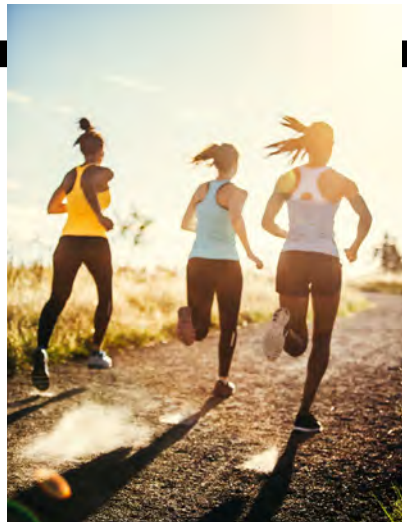
2010
Derek van der Kooy uses stem cells to restore sight in blind mice

2013
Milica Radisic becomes the first to use electrical pulses to turn stem cells into mature cardiac cells, signalling a significant advance in tissue engineering

PHOTOGRAPHS BY (TAK MAK) COURTESY U OF T ARCHIVES; (MOUSE) JOE ZELLNER/ISTOCK; (TOP RIGHT) RYAN J LANE/ISTOCK

U OF T MISSISSAUGA OPENS A NEW CENTRE FOR DIABETES RESEARCH

The $40 million Novo Nordisk Network for Healthy Populations will improve diabetes care, enhance prevention and lower risk



Researching a complex disease like diabetes requires a collaborative effort, and U of T has just embarked on one of the biggest collaborations between industry and public health in Canada's history. Novo Nordisk, a global health-care and pharmaceutical company based in Denmark, and U of T are each investing $20 million to create the Novo Nordisk Network for Healthy Populations, with a goal of improving the lives of people with diabetes and those at risk of developing diabetes and other chronic illnesses. "This is an outstanding opportunity to really do some truly impactful research on making populations healthier," says endocrinologist Lorraine Lipscombe, the network's director, an associate professor in the department of medicine and a senior scientist at Women's College Research Institute.

The network unites three U of T partners – the Temerty Faculty of Medicine, the Dalla Lana School of Public Health and U of T Mississauga – to carry out research, education and outreach tackling various aspects of diabetes management, risk and prevention, both in the health-care system and in high-risk communities.

Among the issues they'll tackle: making diabetes health-care services more co-ordinated and accessible to patients; examining built environments to see how adding walking trails and cycling lanes and other opportunities for physical activity could decrease disease risk; investigating whether digital tools can help people manage their diabetes; and improving outcomes for people going through health-care transitions, such as young people with Type 1 diabetes who fall through the cracks when they start managing their own care at age 18.

Based at UTM, the network will use Mississauga as a living laboratory to test various programs. The city is an ideal location for several reasons. The rate of diabetes in Peel Region (where Mississauga is located) is 26 per cent higher than the provincial average. It has large South Asian, Latin American, Indigenous and Black communities. These groups have a higher genetic risk of diabetes and many face poorer health outcomes due to socioeconomic factors such as income, education and discrimination. What's more, the city has many car-dependent neighbourhoods that limit walkability. "One of the big priorities is to ensure that we focus on equity, making sure our solutions are accessible to vulnerable populations," Lipscombe says.
—Marcia Kaye

THREE WAYS CANADA CELEBRATED INSULIN'S 100TH ANNIVERSARY

A stamp

This Canada Post stamp, unveiled in April, features an excerpt from Frederick Banting's unpublished memoir and an original insulin bottle with its distinctive red cap. U of T researchers Scott Heximer and Patricia Brubaker worked with Canada Post and the Banting House National Historic Site to ensure the stamp's historical accuracy and help source archival material.

A Heritage Minute

A Heritage Minute film, released in May, follows the journey of a young Leonard Thompson, who would become the first diabetes patient to be successfully treated with insulin – at Toronto General Hospital.

The decision to highlight the story of a single patient stemmed from a desire to emphasize the human element of the Nobel Prize-winning discovery, says Christopher Rutty, an adjunct professor at U of T's Dalla Lana School of Public Health and one of three historical consultants on the team that created the 60-second clip. Alexandra Carter, science and medicine librarian at U of T's Thomas Fisher Rare Book Library, says she was struck by the historical accuracy of the film's visual details. "We have photos of the lab; it's this shoddy-looking, cluttered space," Carter says. "I love that they put that in."

A toonie

The Royal Canadian Mint issued a commemorative $2 coin, or "toonie," in July. Designed by Ontario artist Jesse Koreck, the "tails" side of the coin features the laboratory tools – a vial, flask and mortar and pestle – that were used in the early formulation of insulin. The coin's artwork also includes representations of the insulin molecule, red blood cells and glucose. A second version of the coin shows the molecule in blue – the same colour that is used to raise diabetes awareness.

assistant professor in the department of nutritional sciences. She found that giving rats elevated stress hormones raised their blood sugar a little, but combining that with a high-fat diet gave them diabetes within one to two weeks. "It was very shocking," Beaudry says. (Her PhD on the subject won the Governor General's Academic Medal in 2014.) It is known that people who have high stress hormones tend to accumulate fat around their mid-section. But how much control do we have over our stress hormones? "We're struggling with that all the time – especially going through a pandemic."

Beaudry is now studying how various hormones affect our fat tissue, which is a major regulator of whole-body metabolism. Stress hormones target different types of fat differently; they seem to particularly target fat around our abdomen, but we don't fully understand why. Not all fat is bad, she says. Unlike harmful white fat, brown fat is packed with energy-producing mitochondria. The presence of brown fat is also associated with lower amounts of central body fat and a lower likelihood of diabetes. "Learning more about how stress hormones target different types of fat may give us insight into how to prevent or manage the onset of chronic diseases such as obesity and Type 2 diabetes," she says.

Bariatric surgery used to be the only effective treatment for permanent weight loss, but Lewis says it is invasive, risky and associated with long-term complications. It likely will be phased out as medical therapies for obesity improve. There are now two medications that help people lose a significant amount of weight safely. One mimics GLP-1, a gut hormone that slows digestion, lowers blood sugar, suppresses appetite, reduces weight and protects the heart. The other is a SGLT2 inhibitor, which also lowers blood sugar and protects the heart, although weight loss is often more modest.

There are also diabetes initiatives across the country. Diabetes Action Canada, under Lewis's direction, is a national consortium of more than 100 researchers. The group teams up with people living with diabetes and their caregivers to learn how to prevent diabetes and its complications and to improve patient care in a variety of ways.

Even after 100 years, there is still no cure for diabetes. But Lewis is hopeful one is on the way. Meanwhile, treatments continue to improve dramatically. "If you develop diabetes in 2021, your life and your life expectancy are completely different than they would have been in 1921," he says. "It's a very exciting, very hopeful time." ■

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UNIVERSITY OF TORONTO

COME FROM

THESE SEVEN INTERNATIONAL STUDENTS AND ALUMNI ARE AMONG THE THOUSANDS WHO CONTRIBUTE TO SCHOLARLY AND CULTURAL LIFE AT U OF T

photographs by Jorian Charlton

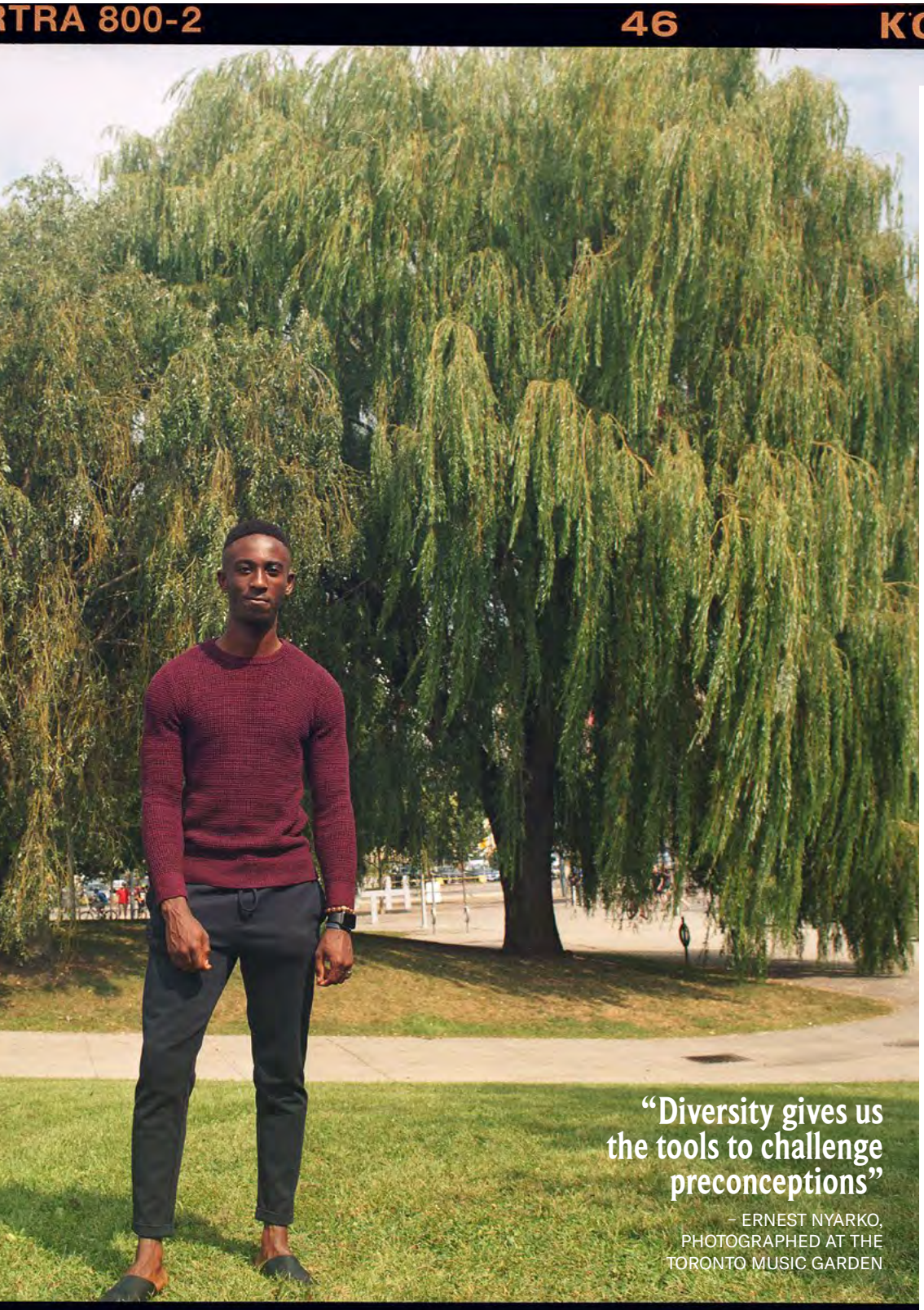
Like many international students, Dhanya Dass finds it easy to talk about how she has benefited from studying at the University of Toronto. "U of T has given me so much," says the third-year student at U of T Mississauga – "new opportunities, new friends and a new creative outlet."

In turn, the university community has also benefited from Dass's presence – and from the presence of more than 20,000 other students from around the world who live, work and study across the three campuses. But what are these benefits, exactly?

It's a question to which Joseph Wong, U of T's vice president, international, has given a lot of thought. For one, he says, Canadian students learn side-by-side with peers who often have direct knowledge of a topic. "It's one thing to read about nationalist movements in Europe or South Asia," he notes. "It's an entirely different learning experience when you can talk to – and learn from – your peers who are from these regions."

This advantage extends beyond the classroom into co-curricular experiences and conversations in residence, he says, adding up to an immeasurable impact on life at the university. "All U of T students gain a tremendous opportunity not only to be prepared academically for the world of work but also to be prepared socially and culturally for the literal 'world of work,'" he says.

To continue to attract top global students, the university, in recent years, has significantly expanded the number – and value – of international scholarships. It has also created a $3-million International Student Experience Fund. "It's not just a commitment to getting international students through our door," says Wong. "It's to ensure that they are in a position to succeed while they're here."



"Diversity gives us the tools to challenge preconceptions"

– ERNEST NYARKO, PHOTOGRAPHED AT THE TORONTO MUSIC GARDEN

WAY

THE CONNECTOR

Ernest Nyarko
Hometown: Accra, Ghana

Five years ago, Ernest Nyarko and his friend Efosa Obano (both BBA 2018 UTSC) teamed up with other U of T undergrads to create the African Impact Initiative, a non-profit organization open to all students. Their objective: to help solve some of the problems faced by communities in Africa.

Since then, the initiative's volunteers have been collaborating with young people from Africa to contribute to the continent's development through community work, mentorship and entrepreneurship. One of the group's first activities was to fund a small project to improve health-care outcomes in the village of Ikot Eko Ebon in southeastern Nigeria.

In co-founding the initiative, Nyarko demonstrated that international students do much more than just study at U of T – their global experiences help their Canadian peers understand the world better. "Diversity gives us the tools to challenge preconceptions and imagine the principles that will shape a better future," says Nyarko, who came from Ghana to study in the co-op marketing and management program at U of T Scarborough, and now works as a

management consultant at Deloitte in Toronto.

As part of his classes and extra-curricular activities, Nyarko was able to describe some of Ghana's "non-Western realities" to his fellow students. "I made a point of sharing my experiences growing up," he says – with the hope of giving his classmates information to question stereotypes about Africa. It's just one example of how, by hosting students from around the world, U of T helps all of its students become better global citizens, he says. – *Gilbert Ndikubwayezu*

THE COMMUNITY BUILDER

Zarina Mamadbekova
Hometown: Khorog, Tajikistan

You studied political science. How did your international peers contribute to your learning experience?
In third year, I took South Asian politics. Most of the students were from Pakistan, Bangladesh and India. I did my readings, but I learned so much in that class because the *discussions* were so enriching. My classmates had first-hand knowledge of what we were studying and were very opinionated, especially on the partition of India. My own opinion of the political situation in South Asia, a place that was foreign to me, came from discussions in that class.

Were you able to share aspects of your culture with your classmates?
I realized quickly that most people know almost nothing about Tajikistan. Every person I met had questions. I felt like I was putting Tajikistan on the radar for them. During a cultural event at U of T Mississauga, I represented Pamir, the region where I'm from. And I gave some short presentations about Pamir in class – about the people, the food, the traditions and religious practices – that seemed to have an impact.

You were also part of a small, first-year seminar on global justice as part of the UTM One Scholars program. What was that like?
We talked about social, religious and political issues on a global scale. There was a lot of disagreement in that class. One of the biggest topics was cultural appropriation and cultural *appreciation* – and what these terms mean. I learned that different communities think about these issues in very different ways.

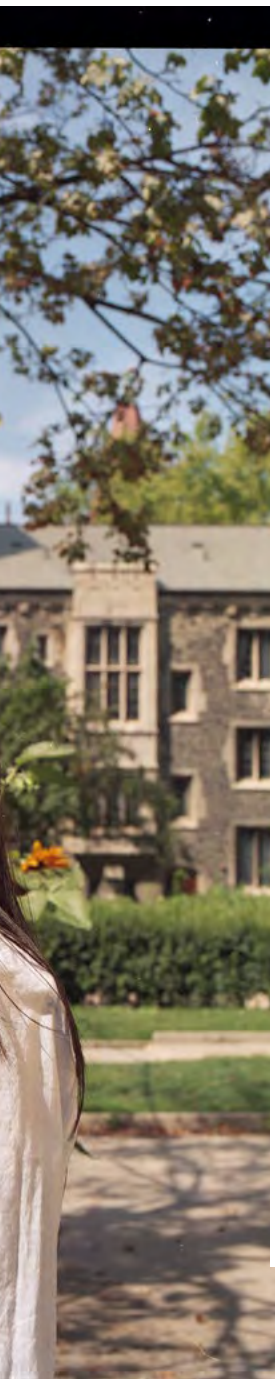
Are you still in touch with classmates from different countries?
Yes! One is from California; another is Spanish but lives in the Philippines; another is from B.C. I love travelling, and now, when I do, I'll have a second home in many places.

Your work at U of T Mississauga relates to international students. How so?
I've been helping to develop a new program called the Global Living,

"I'm grateful that my research and performance have connected me with contemporary artists from around the world"

—JIALIANG ZHU, AT LORETTO COLLEGE RESIDENCE

Learning Community. First-year students from different countries, including Canada, will live together in residence. It's one thing to talk about global citizenship, but it is something else to live in a community with people from so many different cultures. International issues will come up in daily life – and so will disagreements. They'll have to figure out how to get past them.
– Scott Anderson



THE PIANIST

Jialiang Zhu
Hometown: Hainan Island, China

Jialiang Zhu loved attending concerts by visiting musicians when she was an undergraduate student in the Faculty of Music, but among the events that influenced her career, one stood out the most. "It was a concert by the Imani Winds quintet, and I was in awe of how connected they all were to each other," says Zhu, a pianist. She vowed that she would play in a group like that one day.

Today, Zhu, who is pursuing a Doctor of Musical Arts degree at U of T, is also a member of the Bedford Trio – an ensemble with a growing international following. She co-founded the trio in 2015 with fellow U of T music alumni Alessia Disimino, a violinist, and Andrew Ascenzo, a cellist. "We shared a passion for chamber music but were also interested in works by contemporary composers, so it was a great fit," she says.

As part of Zhu's doctoral work, she would like to extend the reach of compositions from her homeland – specifically songs based on classical Chinese poetry. Many of the poems she's studying were part of the public school curriculum in China, where she memorized them in Mandarin.

"Unlike many of my classmates, I loved reciting them because the language had unique tonal inflections that already sounded like music to me," she says. "My goal is to expose English-speaking musicians and audiences to this wonderful poetry and the contemporary art songs inspired by it." Zhu's thesis offers practical tools for learning to understand the poetry, such as a Mandarin diction guide and recorded pronunciations.

Zhu has performed some of these songs in Canada and China and online with native Mandarin speakers and non-native speakers, including Chinese diaspora musicians and those from other cultures. "I'm grateful that my research and performance have connected me with contemporary artists from around the world," she says. "I hope this will plant the seed for something that continues to grow."
– Megan Easton

THE BANKER

Jose Ignacio Valdez
Hometown: Lima, Peru

Jose Ignacio Valdez belonged to the Latin American business club when he was an MBA student at the Rotman School of Management, and he remembers talking to his fellow members about how strange the networking and recruitment events felt. "To us, it was very odd approaching people we'd never met to give them our elevator pitch and try to strike up an engaging conversation," says Valdez, who completed his degree alongside his wife, Brenda Balcázar (both MBA 2010). They were accustomed to more formal practices, such as relying on referrals and applying to posted positions.

Valdez, who grew up in Peru, knew he would have to get over his discomfort with this cultural difference to have any chance at landing a job, especially since it was the height of the 2008-2009 recession. "You only get one shot at the best of times to make the right impression when a firm is recruiting," he says. "Fortunately, a Rotman priority from day one is to ensure students understand how Canadian executives think and do business, both through classes and guest speakers." He turned out to be one of the few in his class to land an investment banking internship, which evolved into a full-time job at a Canadian bank. After working there for several years, he returned to Peru as director of the country's investment banking team for Scotiabank. Today Valdez is Scotiabank's managing director, head of Latin America investment banking. "I feel like I have the best of both worlds," he says. "I get to work for a Canadian company, but in the Latin American market."

Being part of a diverse student body at Rotman not only assured Valdez he wasn't alone in taking some time to acclimatize to a new business culture, but also prepared him for the challenges of working for one of Canada's most international banks. "We learned to be sensitive to cultural differences, a skill that's very helpful in my current day-to-day work interacting with clients and colleagues from Canada, the U.S. and across Latin America – which is culturally diverse in itself," says Valdez. "The MBA program was

a great training ground for the real world of international business." – *Megan Easton*

THE THEATRE ARTIST

Dhanya Dass
Hometown: Kuala Lumpur, Malaysia

What was your first impression of Canada?
I actually didn't know what Canada was like before coming here, except that it was super cold. But after my arrival, I realized how much it felt like home. There was a really welcoming vibe.

How was your first year away from Malaysia?
Challenging – but rewarding because of that. I didn't know where I was going to end up. I had juggled academics and the performing arts my whole life – and both were crucial to my happiness. But I struggled to find a new creative outlet at U of T Mississauga. What kept me strong was the friendships I developed. The friends I made are like family to me now.

Did you get the chance to talk to your fellow students about Malaysian culture?
Yes, I had roommates from India, Zimbabwe and Canada. One thing people find hard to grasp is I'm ethnically Indian but from Malaysia. I don't say I'm Indian because I've never been to India. We practise some of the same traditions but I come from a very different culture overall. I am proud of my Indian heritage and proud to be Malaysian. I think it helps for people to understand these nuances. For my part, it's interesting to hear someone who grew up in Zimbabwe talk about how her experience as a Black person there is different from her experience as a Black person in Canada.

You worked for a Hart House Theatre show as an assistant director. Why was that meaningful for you?
I finally found my creative outlet! For a while, I would come home at midnight or 1 a.m. almost every day and have to get to 9 a.m. classes the following morning. I did it because it's my passion. I need to be around creative people. And I was appreciative of how much effort Hart House Theatre puts into recognizing that each individual has something unique to contribute.

Something must have clicked for you to continue with the theatre as a work-study student...
I applied for the program thinking I would help with staging and promoting shows, but because of COVID, everything went online. I organized virtual workshops. One of my proudest moments was conducting a workshop with the musical director of *Hamilton*. We also staged an interactive theatrical piece about the rise of domestic violence during the pandemic.

What's next for you?
I'd like to combine my studies in behavioural economics with my interest in inclusivity and my passion for the arts. – *Rebecca Gao*

THE MENTAL HEALTH ADVOCATE

Suddene Stone
Hometown: Central Village, Jamaica

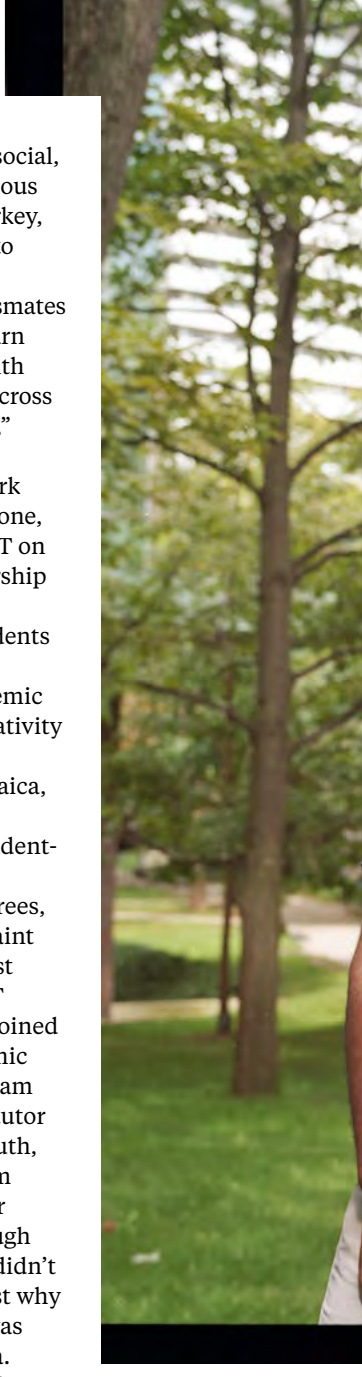
It wasn't until public health regulations required an end to in-person classes partway through Suddene Stone's first year at U of T Scarborough that he truly understood how globally diverse his new classmates were. "When the pandemic hit, and people went home, I suddenly had friends in many different time zones," he says.

For Stone, who is in the third year of a psychology degree, moving to multicultural Toronto from his native Jamaica expanded his worldview in ways he didn't expect. It hasn't been just about trying new foods. He has been able to observe – and compare – social, cultural and religious customs from Turkey, India and Egypt, to name just a few countries his classmates are from. "You learn how to interact with different people across different cultures," he says.

Community work is important to Stone, who attends U of T on a Pearson Scholarship (awarded to international students who demonstrate exceptional academic achievement, creativity and leadership qualities). In Jamaica, he often spent weekends in a student-led service club, helping to plant trees, for example, or paint schools. In his first semester at U of T Scarborough, he joined the Imani Academic Mentorship Program to volunteer as a tutor for local Black youth, to encourage them to consider higher education. Although eager to help, he didn't understand at first why such a program was needed in Canada.

He soon heard first-hand from his mentees about racism in the Canadian education system, including high expulsion rates and discrimination from teachers. "Even in middle school, they understand that much more work needs to be done in Canadian society to achieve racial equity, especially for students."

With respect to his own studies, Stone



“People who are seriously mentally ill often go undiagnosed or don’t have access to proper care. I want to help change that”

—SUDDENE STONE, AT PHILOSOPHER’S WALK

plans to complete a master’s and PhD in clinical psychology, and aims to gain practical experience in the field while in Canada. “People who are seriously mentally ill often go undiagnosed or don’t have access to proper care,” he says. “I want to help change that.” – *Matthew DiMera*

THE COMPUTER SCIENTIST

Mahak Khurmi
Hometown: Sri Ganganagar, India

Everyone knows that for mathematicians “show your work” is an important rule. So when Mahak Khurmi, who is majoring in computer science and statistics, talks about her success, she is eager to describe the problems she had to solve on the way there.

Dreading math at the beginning of high school, she attacked the subject with a tutor – and finished high school in the top one-tenth of one per cent of math students in India. It’s no surprise, then, that she tackled her first challenge as a U of T student in the fall of 2019 with similar fervour.

“When I came to Canada, I was very homesick,” says Khurmi, who grew up in a small city in northwest India, and is the first in her immediate family to attend university. “One thing that helped me was reaching out when I was in trouble.” She joined a First-Year Learning Community, a small group of students registered in the same core courses.

She found other ways to connect with her peers, too. High school in India, for example, had equipped her with educational concepts and strategies that she was able to share with her Canadian classmates. One expressed curiosity about the speed with which she and another Indian student could solve certain math problems. “I told him about some of the formulas and methods taught to us, and he was very surprised and happy to learn about them,” she says.

Now entering third year, Khurmi helps others understand software development and machine learning – two subjects she is passionate about. She has taught concepts in artificial intelligence to more than 300 African students through an inter-university initiative. She has also worked as a software engineering intern for a Toronto startup.

In the long run, Khurmi is thinking about pursuing a PhD. This year, however, she will be helping incoming students make a smooth transition to university life. As an academic programmer for New College residence, she’ll be a great resource for international students facing the same challenges she did. “One really great thing about U of T is that you get to meet people from everywhere,” she says. – *Cynthia Macdonald*

BY
NICKITA LONGMAN

A hunter near Rankin Inlet, Nunavut, stands in the middle of a herd of caribou during the summer migration. The Qamanirjuaq herd, which migrates along the coast of Hudson Bay as the weather changes, is the largest of its kind in North America

don't get enough to eat. U of T Mississauga anthropologist Tracey Galloway believes Inuit communities, not southern governments, have the solution

Photographs by Cody Punter

AS SUMMER ENDS AND THE COOLER MONTHS NEAR,

the northerners who live along the shore of Hudson Bay, in Arviat, Nunavut, busily prepare for the fall and winter hunting seasons. Soon, beluga whale hunters will set out in boats, casting nets along the way in the hope of also catching Arctic char. Herds of caribou passing nearby will provide an opportunity to secure meat and fresh skins to keep the community fed and warm.

Gatherers know that the mussels are at their meatiest and most mature in August, making them an end-of-summer staple. They also collect Arctic cotton, which can be dried and used as wicks for candles. Cloudberries, cranberries, crowberries and blueberries are ready to be picked. And fireweed blooms – commonly referred to as pink flowers – are ready to be dried for jellies.

Kukik Baker, an Inuk community member, says the residents of Arviat work hard during harvest time to secure enough of this traditional food – known locally as "country food" – for everyone in the town of 2,700. They try to plan carefully to avoid shortages. In recent years, though, hunting and fishing yields have diminished due to climate change. Federal government programs designed to provide northern communities with access to healthy and nourishing foods at affordable prices don't seem to be working as they should. These factors contribute to Nunavut having the highest rate of food insecurity in Canada. Many households, including some in Arviat, don't get enough to eat.

Tracey Galloway, an associate professor of anthropology at U of T Mississauga, has been studying food insecurity for nearly two decades, and is all too familiar with its impact in northern communities. In the mid-2000s, she participated in a study on the health of the Inuit population living in the High Arctic, which found that 65 per cent of households, including 71 per cent of households with children, reported moderate to severe food insecurity. Almost 15 years later, not much has changed.

Aware of the health burden that can result from not having enough food, Galloway wondered how she, a southern researcher, could help. The federal government had been providing subsidies for food in northern communities for more than 50 years, but little research had been conducted about the effectiveness of these programs. Were the subsidies sufficient to address food gaps in northern communities? Were they ensuring that nutritious food was more accessible in the North? The Inuit health study had suggested otherwise.

Galloway decided to undertake a review of the Nutrition North Canada program, which, in 2011, replaced the long-running Food Mail program as a way of lowering the cost of shipping nutritious food to northern grocery stores. Under the old program, Canada Post received federal funds to transport nutritious and perishable food items that were not otherwise available year-round in northern communities. After 2011, these subsidies were redirected to individual retailers, who had to cover the costs of transporting the goods themselves. Through her research, Galloway found there was no way to ensure that northern food retailers, most of which are owned by the North West Company, were actually using the subsidies to deliver on affordable food pricing. She recommended stronger retail oversight for the Nutrition North program.

"WHAT STARTED OUT AS A FOOD SECURITY PROGRAM ENDED UP BEING A REALLY HOLISTIC OPPORTUNITY FOR THE YOUTH"

Clockwise from left: In Rankin Inlet, Nunavut, about 200 km from Arviat, a group of men lay out their catch as part of a trout fishing derby; a woman slices *maktak* (beluga whale blubber) into strips for grilling on an open fire; people fish for Arctic char on the Diana River, just outside of Rankin Inlet; a woman filets Arctic char while taking part in the Niqitsialiuq women's cooking program, which is rooted in Inuit culture

In Baker's view, the shift from Food Mail to Nutrition North was not a positive development for Arviat residents. "The [previous] program worked well for a lot of us because we had more say in what was coming into the North," she says. "But with Nutrition North, retailers would lower the price on items that people didn't necessarily need every day." She cites junk food and soft drinks as examples.

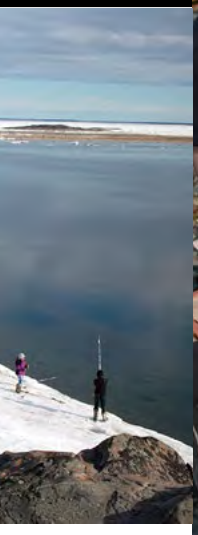
Joe Karetak, an Inuk hunter in Arviat who works to reduce food insecurity in the community, says southern-influenced solutions often fail because they disregard the unique food needs of northern communities. "Our traditional food continues not to be included in lists of recommended food," he says.

The importance of a traditional diet is ignored in other ways as well. Baker and Karetak say there is little federal funding for infrastructure in Arviat to store, harvest and clean traditional foods. They say support for local food storage facilities, butcher shops, meat packaging plants and greenhouses would help the community store country food and distribute it throughout the region.

As part of her current research, Galloway has teamed up with the Centre for Indigenous Environmental Resources in Winnipeg to examine how northern communities are coming up with their own solutions to food insecurity. Both she and the centre prefer the term "food sovereignty" to describe how northern communities actively and independently address their own dietary needs. She says there has been a shift over the past decade toward food sovereignty in Arviat. "Community leaders, Elders and youth are mobilizing around this issue and creating innovative approaches that address both food security and climate risk in their areas," she says.

Karetak has been hunting and harvesting food since he was a youth and consuming a traditional diet since he was born. Now, he is passing on his knowledge to his children and other youth in Arviat through his work as an *Inuit Qaujimajatuqangit* ("sacred Inuit knowledge") research co-ordinator at the Aqqiumavvik Arviat Wellness Society, a local alliance of mental and community health groups. "My father promoted sharing so [my siblings and I] understood that we have to share resources and food without expecting anything in return," he says. "As a hunter-gatherer society, you can't always be successful. But maybe your neighbour was, and that's what will get you by."

Karetak started bringing together hunters



in the community in 2012 to set out in search of game, and then distribute the meat throughout the community. Since then, these informal hunting parties have turned into the Young Hunters program, in which Inuk Elders and instructors guide youth on how to hunt sustainably and to create and maintain traditional implements such as *ulus* (a cutting tool), harpoons and harpoon heads.

Galloway has examined the Young Hunters program and found many benefits for Arviat youth. Among them: they learn how to build and maintain equipment such as *qamutiiks* (the sleds used to transport equipment and harvested food); they learn how to navigate over snow and ice in unpredictable weather; and, perhaps most importantly, they learn the importance of sharing and distributing country food with people in the community who cannot hunt for themselves.

Baker, the executive director of the Aqqiumavvik Arviat Wellness Society, says the Young Hunters program also incorporates contemporary knowledge, such as how to plan a trip using GPS technology. The program hosts four intakes a year, with about 10 youth per session. "What started out as a food security program ended up being a really holistic opportunity for the youth, and really changed their outlook on life," Baker says. "At the end of the first program, we surveyed youth participants and their families and learned there were improvements to the youth's mental health."

The society also hosts courses on nutritional meal planning and food budgeting. On the society's website are recipes and tips for growing your own food, as well as information about maternal health. *Inuit Qaujimajatuqangit* (pronounced kow-yee-ma-yaa-tu-kang-iit) is at the foundation of all programming and outreach initiatives offered through the society.

While Baker and Karetak invest a great deal in preparing new hunters to feed the community sustainably, climate change is upending their plans. "We are constantly having to readjust because we aren't sure what one season will look like to the next," Karetak says.

Research has shown that migration patterns of important food sources, such as beluga whales and caribous, are changing, forcing hunters further from home. At the same time, unpredictable weather and ice conditions are making it less safe for harvesters to travel long distances. As water temperatures rise, Arctic char, a crucial component of the traditional Inuit diet, are moving north, limiting the duration of the fishing season. "We used to be able to set nets as far south as Churchill for char," says Karetak. "But you can't do that anymore as their migration stays much more north to the colder waters."

Karetak remains hopeful about his community's ability to adapt. "Once someone

Left: Women in the Niqitsialiuq cooking course learn how to make a smoker to hang dry fish. Top: A hunter and his family return to their vehicle after spotting a caribou. // Our photographer, Cody Punter, was unable to travel to Arviat for this story. Included here are photos he's taken over the past three years in Rankin Inlet, where Inuit practices of hunting, gathering and preparing traditional food are similar

figures something out, we all learn from that person, and tell someone else how it works, and so on." He no longer has much faith left in federal government-issued answers. Instead, he and Baker are emphasizing the importance of passing traditional knowledge on to the younger generations. "Our whole work is rooted in trying to help communities start planning for their own well-being," Karetak says. "We know that won't come from the government. They're not going to help us hunt better."

Galloway has come to understand why many northerners have lost confidence in federal solutions. "The big picture is that all of these factors – food, shelter, transportation, health and climate change – are all so closely interconnected and inevitably cause stress on one another," she says. She believes that change can happen in the North, but not enough resources are supporting the resilience and ingenuity that already exists; funds continue to be misdirected into the hands of retailers. "Northerners live rich, fulfilling lives within their communities and regions, and these lives are only rarely and temporarily dependent on things or people in southern spaces," says Galloway. The answers, she believes, are there within the community.

"Self-determination is just that: the ability for communities themselves to say what needs to be done," she explains. "Only people that live in these places know how to eliminate the hunger and hardship some people face every day. We really need to listen to them, and to be led by them to a better future." ■

"I am passionate about improving the lives of older adults and investigating issues at the intersection of aging and technology. I believe that creative, meaningful innovations stem from working alongside older adults and their caregivers."

— **Dr. Charlene Chu**
(BSc 2004, BScN 2006, MN 2010, PhD 2015)
Assistant Professor
Lawrence S. Bloomberg Faculty of Nursing

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Photo by Stephen Frost Photography

Blurring the Blue Line

Student Rachel Bromberg and alum Asante Haughton are helping to create a response service for mental health crisis calls in Toronto that relies less on police

ILLUSTRATION BY FRANZISKA BARCZYCK

AS a peer worker at a youth mental-health agency in Toronto, Rachel Bromberg, 26, often encountered individuals in crisis. "Folks would tell me that they weren't comfortable sharing suicidal thoughts because they were worried I would call 911," says Bromberg, who is now pursuing a joint degree in law and social work at U of T. "Maybe they've had bad experiences with police before or maybe they've heard stories of other people who have had bad experiences with police. Maybe they're from communities that police have traditionally not been very good to."

She started thinking, *there must be a better way to respond to mental health crises.*

In September 2018, while still an undergrad at U of T, she recalls searching online and finding a program in Eugene, Oregon, that pairs an emergency medical technician with a crisis worker to attend to mental health crisis calls received through 911 or through regular police channels. "They've basically replaced police as first responders to a lot of these crisis calls," she says.

Bromberg shared her findings with a friend and co-worker, Asante Haughton (BSc 2009 St. Michael's). Together, they began to think about how a similar program might work in

Toronto, a vastly larger city. "If you had a team in the downtown core that was responding to crisis calls in the northeast, it would take them too long to get there," says Bromberg. Toronto is also more diverse, so responders would need to be chosen from the communities they were serving. "Asking someone to communicate in their second language when they're in crisis is not reasonable," she says.

To deal with these concerns, Haughton and Bromberg struck upon the idea of engaging with multiple partner agencies in mental health (unlike Eugene, which teamed up with one mental health organization). Under this model, each partner agency would be expected to be familiar with the languages and cultures present in their immediate area and would be able to respond to an incident quickly.

The pair began reaching out to people who worked in mental health agencies and within the police department in Toronto. The initial reactions, Haughton recalls, were skeptical. "They would say, 'It sounds like a good idea, but it will never happen,' or 'The infrastructure isn't there.' There was always a reason why it wasn't possible."

Frustrated but undeterred, they started compiling information and data provided by organizers from other cities, and discovered that there had been no deaths or serious injuries among staff at any civilian-led mental health crisis program. They also learned that, in 2019, fewer than one per cent of the calls fielded by Eugene's program required police back up.

After the murder of George Floyd, in May 2020, protests calling for police reform popped up across the continent. Around the same time, several racialized people – predominantly Black and Indigenous Canadians – experiencing mental health crises died during encounters with law enforcement. D'Andre Campbell was killed by Peel police in his Brampton, Ontario, home. Regis Korchinski-Paquet fell to her death after Toronto police were called to her family's apartment. And Chantel Moore was shot and killed by police in New Brunswick who were called to perform a wellness check at her home.

For Haughton, in particular, these deaths hit a nerve. Born in Jamaica, he was raised in Toronto by a single mother who experienced mental illness. His mother had difficulty finding help, which is one reason he became an advocate for mental health. "We, as a family, weren't able to support her," Haughton says. "When I started working in mental health, I saw what my family and I experienced play out in many other people's lives."

RISK TO CIVILIAN WORKERS IS LOW

89%
of 911 calls for a mental health crisis do not involve harmful behaviour toward others

Fewer than 1%
of calls require police back up

There have been **zero** deaths or serious injuries among staff at civilian-led mental health crisis programs

The deaths also shifted thinking within Toronto's city government and elsewhere across Canada, Bromberg recalls. "People started saying, 'We need alternative crisis response services. Police should not be first responders to mental health crises.'"

Bromberg and Haughton decided to formalize their partnership. They created a non-profit organization to help develop a civilian response to mental health distress calls in Toronto, and named it the Reach Out Response Network. They co-wrote an op-ed for the *Toronto Star* explaining their idea. The article helped boost the organization's profile, and people began volunteering to help. Soon after, Bromberg and Houghton connected with Mohamed Shuriye, the newly appointed manager of policing reform at the City of Toronto, who committed the city to work with the group. "It was a no-brainer," he says.

Together, the Reach Out Response Network and the City of Toronto hosted community roundtables, focus groups and town halls over the summer and fall of 2020. Through these consultations, they heard from several people who felt that their communities had been disproportionately affected by incarceration and police violence.

It also became clear to Bromberg and Haughton that it would be important for the program to consider the particular needs of Indigenous people. "Because of historical trauma, racism and colonialism, and because of oppression that they have experienced and continue to experience, we want to

ILLUSTRATION BY FRANZISKA BARCZYCK; SPOT ILLUSTRATIONS BY DAVID SPARSHOTT

make sure that Indigenous folks are the ones building the services that are for their communities," says Bromberg. "We recognize that Indigenous cultural practices need to be incorporated into providing crisis support."

Last February, Toronto city council approved four pilot projects, allocating $1.7 million to development costs for the program they have renamed the Community Crisis Support Service. The pilots will run in three neighbourhoods: in the downtown eastside, Scarborough and Etobicoke. The fourth will be designed by and for Indigenous communities; the neighbourhood has yet to be determined.

Each project will support about 11 full-time positions. The city will select "community anchor" partners to run the projects and help train crisis workers. Shuriye expects teams will consist of two trained crisis workers, who could include paramedics, peer workers, harm-reduction workers, Elders or nurses. 911 operators will determine whether to dispatch a crisis team or police, though individuals can also call 211 to access the service.

The pilots will begin in early 2022 and run for three years. If successful, the program could be expanded to cover the entire city by 2026.

For Bromberg, who has kept up her studies throughout the process, it has been gratifying to see the work and the data she and Haughton have collected over the years put into practice. She hopes to continue working to address systemic problems in the mental health field after she graduates.

For Haughton, the feeling is more personal. "My mom almost died because she couldn't get the help she needed during a mental health crisis," he says. "Our lives might have been different if this service had been available to her." **—Andrea Yu**

AN ORIGIN

Nite of Nights

An annual revue, written and performed by engineering students, lampoons its way into a second century

Skule Nite was born on an unseasonably mild Wednesday evening in March 1921. It came into the world as "Ngynyrs in SPaSms," a 13-act variety show written, directed and performed by U of T engineering students, which premiered at Massey Hall to a large crowd and, according to a review in *The Varsity* student newspaper, thunderous applause.

Just three years out from the First World War, the show centred on the pitfalls — and pratfalls — of army life, featuring such numbers as "Adventures of Chloreen," the tale of a "wicked king," "his jolly murderers" and a poison gas attack. The student band Toike Oikestra supplied music for the occasion, instructing audience members to shed their shoes and stockings each time they played, "How Dry I Am," Irving Berlin's waggish paean to Prohibition and a popular drinking song of the day.

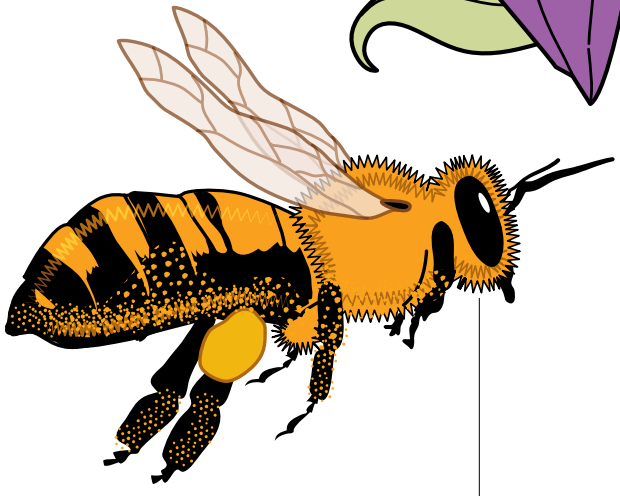
A roaring success, the revue became an annual event, playing before an even larger crowd of 2,000 in 1922. In 1923, the newly baptized "School Night" made its debut at Hart House Theatre, and with a few exceptions (including a temporary stay at the Royal Ontario Museum during the Second World War), the show has been staged there ever since.

Skule Nite's popularity has waxed and waned over the years (adherence to standard spelling has mostly waned), but Rob West (BASc 1981), a former cast member, stage manager and director says "the show and its organizers have shown a remarkable ability to roll with the punches, including pivoting to an entirely virtual production this year due to the pandemic."

Last April, more than 1,000 alumni and friends tuned in to a livestream to watch an Old Hollywood-inspired tribute to the 100th anniversary of the show. And to mark the occasion, West and a group of fellow Skule Nite alumni established two new funds to keep the cherished theatrical tradition alive. "It's our mission to provide that sense of community and lasting friendships for future generations of engineering students and alumni," says West. They have raised more than $50,000. **—Alice Taylor**

Which bees are the best pollinators? It depends on more than the bee

MacIvor's lab has placed cameras at gardens across Toronto to see how urbanization influences bee communities. A camera in front of this great blue lobelia flower records the type of bees that visit. The footage is analyzed by computer software to determine the duration of each visit.



It is difficult to overstate the importance of native bees. Without them, many plants would struggle to survive.

"Bees are the most effective and diverse pollinators in the world," says Scott MacIvor, a biology professor at U of T Scarborough. He is particularly interested in the role bees play as pollinators in cities to support green spaces such as community gardens, urban parks and household gardens. Knowing exactly which pollinator-dependent plants are visited by which type of bees, and what landscape conditions need to exist within cities for pollination to flourish are important questions driving the research.

MacIvor and his colleagues, including PhD student Nicholas Sookhan, are using high-resolution cameras set up in front of flowers they've planted in community gardens throughout the city. For hours at a time, they are able to record the types of bees that visit the flowers, and the duration and number of visits. Additional camera technology is used to determine the amount of tiny pollen grains deposited. Using this method, they can also track individual flowers from when they're planted until maturity, and then collect seeds from these flowers to measure the effectiveness of the pollination.

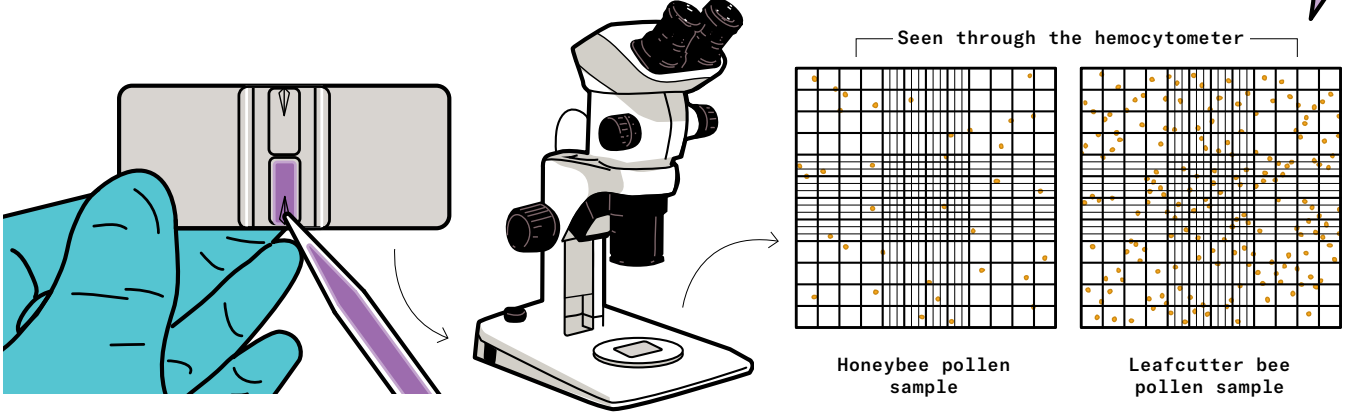
MacIvor is also interested in the difference between the quantity and quality of pollination visits. Pollinators vary in their effectiveness – one type of bee might be better at pollinating a specific type of plant. "This is one reason why conserving native bee populations in cities is so important," he says. **—Don Campbell**

THE HONEYBEE

The honeybee is non-native to Ontario. It collects and deposits less pollen than a leafcutter. Pollen grains are gathered on the bee's legs but some grains also cling to hairs on its body.

WHAT IS A HEMOCYTOMETER?

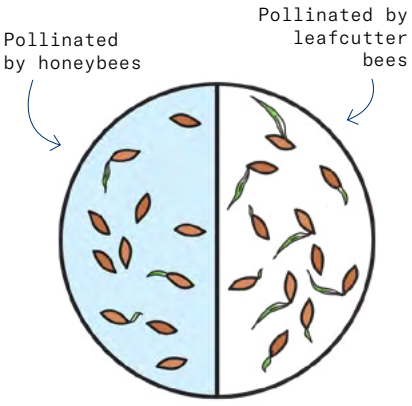
This device was originally designed to count blood cells. MacIvor's lab uses it to count the number of pollen grains gathered by bees. Researchers carefully remove pollen grains from a bee and place the grains into a vial. Next, they add a solution and run it through a centrifuge. An organic detergent helps spread the pollen more evenly. The researchers then use an eyedropper to add the pollen solution to a slide and count the pollen using a microscope and computer software.



THE LEAFCUTTER BEE

Many species of leafcutter bee are native to Ontario. These bees collect and deposit a relatively large amount of pollen. Pollen clings mostly to the underside of its abdomen but also to tiny hairs on its body.

The stigma is the female part of the flower where pollen is deposited. The lab uses image-contrast software to calculate the area of the stigma covered in pollen, which is just as effective as manually counting the pollen grains but keeps the stigma intact. This allows researchers to track the entire pollination process, including how many seeds each flower produces, and how many of the seeds germinate into new flowers.



IN THE END, GERMINATION

MacIvor's lab uses a chemical process to germinate seeds in a petri dish without soil. The number of a flower's seeds that germinate depend on the bees that pollinate the flower. A flower visited by many different bee species will collect more pollen, typically resulting in even more germinated seeds.

ILLUSTRATION BY REMIE GEOFFROI

Reading the Mind

As a teen, Keisuke Fukuda wanted to improve his memory to do better in school. Now a psychology professor at U of T Mississauga, he studies how the brain makes memories — and why it sometimes fails

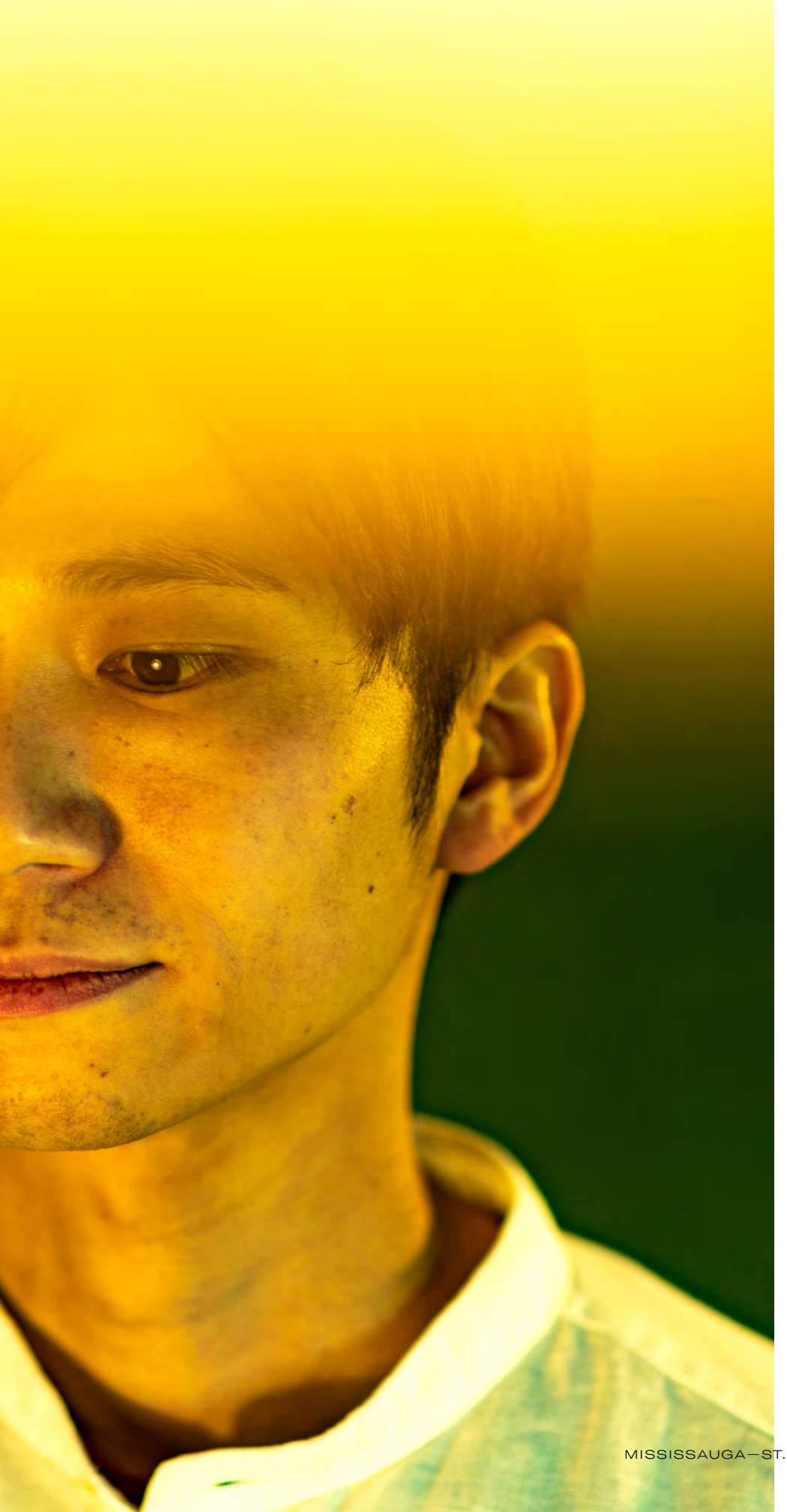
PHOTOGRAPHS BY KATE DOCKERAY

Keisuke Fukuda sometimes receives texts from his wife with photos of things in their kitchen. A large bowl on a top shelf, for example, or a platter in a lower cabinet. They are not-so-gentle reminders about the items' proper homes, intended for reference when he is emptying the dishwasher and forgetting – once again – where they go.

For a psychology professor who studies memory and attention, this could be embarrassing. But for Fukuda, it's inspiring. "The mundane moments where my memory fails drive me. They reveal again and again that, while the mind may be a highly efficient information processor, it's far from perfect. But I believe there are ways we can make it better."

Fukuda is an assistant professor in U of T Mississauga's psychology department, where his research focuses on determining the brain mechanisms underlying memory and their behavioural outcomes – he calls this "reading the mind." With this insight, he aims to "lead the mind" to improved functioning with techniques designed to optimize our memory.

In his lab, he employs two main methods to explore the frequent disconnect between what information our brains are in fact storing and retrieving and what we are trying to remember. With electroencephalogram (EEG) technology, Fukuda monitors electrical activity generated by the brain while research participants complete memory tasks. "This shows us the neural operations that lead to success or failure at encoding and retrieving information," he says. The other method tests the memories of large numbers of participants to measure individual differences in our ability to hold



UTM psychology professor Keisuke Fukuda

←

recent and remote memories in mind while we compare them to what we are currently seeing. We naturally vary in this ability – known as visual working memory – with some people able to maintain three or four objects in mind, and some just one or two at any given moment.

One of the most common visual working memory tasks used in the Fukuda lab – and others worldwide – is the change detection test. In it, participants are briefly shown several simple items on a screen before they disappear. After a second or so, just one item reappears in a location previously occupied by an item in the original series, and the participants must indicate whether it's the same as or different from the original. Using a series of these tests, researchers can estimate an individual's visual working memory capacity.

Back in high school in Japan, Fukuda felt like he had very little innate aptitude for memorizing – especially when he thought a subject was boring. One year, a dreaded history exam full of minutiae was looming, and he was desperate. "I was a lazy student and wanted to know how I could make the minimum effort to pass the course," he says. "It struck me that, if I knew how my memory operated, I could get the most out of it." Since his parents made the internet off limits to him at home, he went to the local bookstore and began reading psychology books at random.

What he discovered in this informal investigation was life-changing in a couple of ways. First, he realized he was deeply fascinated by the science of memory. Second, he picked up some valuable study tips based on two principles of

Fukuda models an EEG cap he uses in his research ←

> "WHENEVER YOU THINK, 'OH, THAT PERSON LOOKS LIKE MY FRIEND,' THIS CHANGES YOUR MEMORY OF YOUR FRIEND"

memory: the testing and spacing effects. "The best way to retain information is to test your memory on it repeatedly, and to spread out the testing over time," he says. "When I tried this, I got good results." Not only did he pass the hated history class, he decided to pursue a psychology degree.

Fukuda completed his undergraduate and graduate degrees in the U.S. before joining UTM in 2016, where his work has built on existing knowledge about optimizing memory. In one study, partly inspired by his experience learning English, he demonstrated that focusing on large amounts of information for a short time is more effective than dwelling on smaller amounts of information for a long time. "Instead of studying 10 new English words each day in the hopes of learning 70 words per week, I looked at all 70 words seven days in a row," he says. "When you see something over and over and start recognizing it, you're practising retrieving that information. Repeated retrieval makes it more accessible later." Knowing how many hours he wasted studying the wrong way, he takes every opportunity now to share evidence-based practices like this with his students. If he had his wish, kids would learn them in elementary school.

Fukuda initially chose U of T because of its reputation for innovative memory research. As a scientist who relies on human subjects, a diverse population to draw from was an unexpected bonus. "I was convinced that I'd landed at the wrong airport when I came for my job interview," he says, noting that he completed his undergraduate and graduate degrees in Oregon – a state that ranks low in racial diversity. "I was fully amazed by Toronto." Diversity is especially important when it comes to probing a concept called 'memorability.'

Memorability refers to the intrinsic properties of a thing that determine how easy or hard it is to remember. The factors that make something memorable include its distinctiveness and its relative importance to the observer. Until recently, memorability was thought to be fairly consistent across individuals and even quantifiable, says Fukuda. "Now, though, psychologists are realizing that memorability may be culturally specific and influenced by shared values and knowledge. It's fascinating and something I hope to examine one day."

So far, his lab has studied how age-related cultural differences affect what people remember. "We presented pictures of various gaming consoles to young people, for example, and they had no trouble remembering them later," says Fukuda. "Older adults had much more difficulty, though they had great memory for images of old-fashioned radios."

One area where memory exposes its fallibility in people of all ages is eyewitness testimony. When we see things that are physically similar to the content in our visual working memory, those memories can become biased toward the new input. For example, when you are looking for your friend in a crowd, you hold their image in your visual working memory. "Whenever you think, 'Oh, that

KEISUKE FUKUDA'S TOP 5 MEMORY TIPS

1. Test your memory often on the material you want to remember
2. Don't cram. Space out your memorization over time
3. Focus on repeated, if brief, exposure to info you want to remember
4. Take breaks! Let your mind rest for at least 15 minutes a few times a day
5. Use digital reminders, alarms, voice assistants and photo aids

person looks like my friend,' this changes your memory of your friend," says Fukuda. It's called similarity-induced memory bias, which means certain contexts and suggestive information can make our memories more vulnerable to distortion.

Fukuda's lab has shown that when people are asked to make deliberate comparisons between new visual information and objects held in mind, the memory bias is larger than if they see the new information but are instructed to ignore it. This is important when someone views a lineup of potential suspects and compares it to their memory of a criminal, which he says could contribute to the frequency of false identifications. In other research, he found that these distortions increase with longer delays between first encoding the memory and making the comparisons, and the bias can persist after the comparisons are over.

We are not aware of these alterations in our working memory as they occur. That's why Fukuda is so keen about the potential for augmenting our memory skills through real-time feedback on cognitive processing. "With the EEG, we can let people know exactly when their brain waves indicate they're doing a good job of encoding and recalling information," he says. "Feedback changes behaviour. Maybe by learning to recognize when our brain is working efficiently we can become better controllers of our memory abilities."

He even half-jokingly suggests that one day students may wear EEG caps to track and enhance the quality of their learning – which would be a far cry from scanning psychology textbooks for tricks. "You shouldn't be in science if you're not optimistic and excited about dreams like this," he says. "The mind is capable of incredible things." **—Megan Easton**

SPOT ILLUSTRATION BY DAVID SPARSHOTT

A RECOMMENDATION

Heady Brews

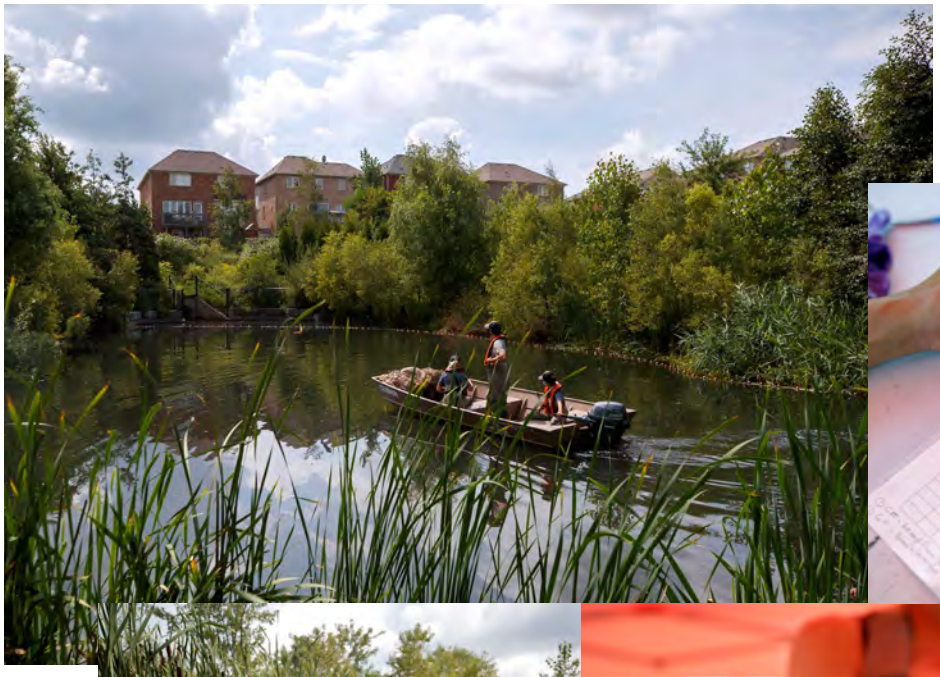
How did lager become the world's most popular beer?

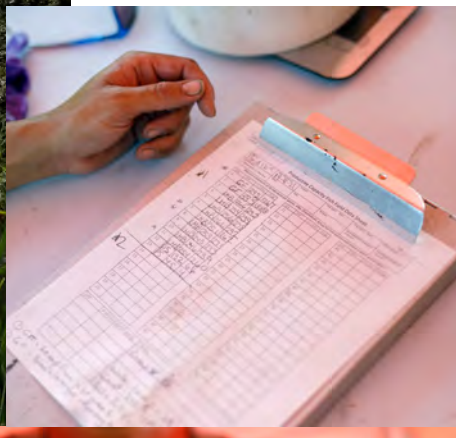
Humans have been brewing fermented beverages for thousands of years. So it's surprising that lager, a sometimes bland-tasting brew that originated in Germany, has risen above the rest to dominate global beer sales. Lagers differ from other beers in that they are brewed at colder temperatures using strains of yeast that sink to the bottom of the tank. They tend to have a crisper, cleaner taste, but tinkering with their other ingredients such as hops and malts can alter the flavour. For a book he is writing, Professor Jeffrey Pilcher, a food historian at U of T Scarborough, is tracing how lager conquered the beer world. Below, in time for the annual German beer festival Oktoberfest, he shares the history – and taste – of three distinct types of lagers. **—Don Campbell**

Bavarian lager
Lager traces its roots to 1400s Bavaria. The word "lager," German for "storage," refers to the cold caves in which the beer was traditionally stored while fermenting. Brewing it during the winter and maturing it in the caves during the summer prevented spoilage and allowed the beer to keep its consistency year-round. Pilcher says Bavarian lagers "tend to be slightly sweeter" than other lagers. He suggests a Munich-style *dunkel* or "dark" lager.

Pilsner
Dismayed by the quality of their local beer, leaders in the Bohemian town of Pilsen founded a town-owned brewery in 1842 and invited Bavarian brewer Josef Groll to run it. He mixed his yeast with local hops and brighter malts to create a clear, golden beer that quickly became a hit. Pilsner is generally drier and hoppier than Bavarian lagers. Pilcher recommends Pilsner Urquell, from the original Pilsen brewery.

Japanese lager
In the 20th century, Japan was the source of two important brewing innovations. In 1967, the Japanese brewer Suntory adapted micro-filtration technology developed at NASA that removed the need for pasteurization. Twenty years later, Asahi Breweries created dry beer using a fermentation process that converts more sugar into alcohol. It's "less sweet, with very little aftertaste," says Pilcher. Popular dry beers include those made by Asahi and Sapporo.





Researchers survey the goldfish population at a pond in Ancaster, Ontario

Ontario's Growing Goldfish Problem

Pets that were released into ponds are becoming 'super-invaders' that could wreak havoc with the ecosystem, says Prof. Nick Mandrak

About an hour's drive west from Toronto sits a modest stormwater pond next to a subdivision in Stoney Creek, Ontario. It's the kind of artificial body of water popping up in newer suburban developments and next to highways to help reduce local flooding.

What stands out about this one, which is about the size of a large backyard, is that it is teeming with more than 20,000 goldfish, the kind that people keep as pets. How did the goldfish get there? What risk do they pose to rivers and lakes? How do they survive in such inhospitable conditions? These are all questions that interest Nick Mandrak, a biology professor at U of T Scarborough.

"These ponds are extreme environments," says Mandrak, whose research focuses on aquatic invasive species. "Not only is the water shallow, oxygen levels are extremely low and temperatures can reach 30-plus degrees in the summer. "Goldfish are hardy, but in this environment only the hardiest of the hardy will survive."

PHOTOGRAPHS BY COLE BURSTON; SPOT ILLUSTRATION DAVID SPARSHOTT

This is a problem, Mandrak explains, because goldfish reproduce at a rapid rate and are voracious eaters, ripping up aquatic vegetation as they hunt for tiny insects to feed on. They can also grow quite big – earlier this year, a four-pound goldfish the size of a football was pulled from a lake in Minnesota. One of the most popular aquarium pets in the world, goldfish originated in east Asia and are not native to Canada.

In large numbers, the fish can destroy natural aquatic habitats such as lakes and rivers and reduce the abundance of native species. Their prodigious feeding habits kick up mud, which clouds the water. Murky water means less sunlight penetrates deep enough to help aquatic plants grow. These plants, which are an important source of food for smaller organisms, also act as ecosystem filters that remove contaminants from the water.

"We don't want the Great Lakes to revert back to being heavily contaminated – with fish we couldn't eat and water we couldn't swim in," says Mandrak. "We want ecosystems that are as natural as possible, with native fish and with wetlands that absorb contaminants so we can enjoy them without fear of getting sick."

Mandrak describes the goldfish as "super-invaders" because they are so adept at surviving and reproducing in these extreme environments, which, he says, will become more common as the climate continues to warm. There are already signs the goldfish are becoming more abundant in the wild. Over the past decade, they have become more prominent in Hamilton Harbour and Lake Erie, in addition to inhabiting stormwater ponds and conservation areas across southern Ontario.

As for how they get there, Mandrak blames people releasing their pets, which have then reproduced. (He estimates goldfish have been living in the Great Lakes for a century, but have only become abundant over the past few decades.) Today, there are at least three different species of goldfish in the wild across Canada.

GOLDFISH FACTS

Goldfish were first kept as pets in China more than **1,000** years ago

Their average lifespan is:
› **10 years** in an aquarium
› **30 years** in ponds
› **40 years** in the wild

Adult goldfish range in length from **12 to 40 centimetres**

In the wild, goldfish can weigh several pounds →

To determine how goldfish survive in harsh conditions, Mandrak's team is studying the age, growth and reproductive status of the fish they find in the stormwater ponds. The team also aims to identify the specific genes that enable the fish to adapt to warmer water that contains less oxygen. Warmer water due to climate change could favour goldfish over native fish – and even over other invasive species, says Mandrak.

The researchers are also comparing the eating habits of goldish caught in Hamilton Harbour to those of native fish. The fish that eat at a higher rate would likely be the winner in a battle for limited food in the wild.

It is important for the lab to know how many fish inhabit a given area, but conventional methods of counting fish are prohibitively expensive and time-consuming. So the researchers are developing a new technique that relies on environmental DNA analysis. Fish shed DNA in their feces and urine; analyzing water samples from the habitat can tell you how many different species live there. Mandrak's lab has teamed up with Fisheries and Oceans Canada on a project that involves draining 10 ponds in Hamilton. This will allow them to compare the number of fish predicted by the "environmental DNA" technique to a count of the actual fish. The researchers hope to refine the technique so they can use water analysis to predict the total number of *individual* fish living in a given area.

"Knowing this is crucial not only for the conservation of native fish, but also for monitoring invasive species," says Mandrak, who is collaborating with U of T professor Donald Jackson on the stormwater pond project. "You can then use that information to determine how to protect natural species and get rid of the invasive ones." **—Don Campbell**

Program participant Ikran Jama ←

Law Firms Pledge Support to Black Future Lawyers

New U of T program encourages Black undergrads to consider law school

A newly formed partnership of leading Canadian law firms has committed $1.75 million to U of T's ground-breaking Black Future Lawyers program. Through their joint pledge, the 14 firms – including some of Canada's largest – will help fund the initiative for 10 years.

Jutta Brunnée, dean of the Faculty of Law, says the gift will give the program the stability it needs to establish chapters at universities across Canada and invest in the country's next generation of Black lawyers. "We know that Black students face systemic obstacles that prevent them from accessing professional school education," says Brunnée. "It's important that we have a long-term vision that will help build a consistently strong number of Black students enrolling in law."

Black Future Lawyers aims to engage with Black undergraduate students who wish to become lawyers and to help the students see themselves in the profession. The Faculty of Law created the program in 2020 in collaboration with the Black Law Students' Association, Black alumni and the broader legal community. The initiative enables students to receive mentoring, take workshops at U of T Law, and attend an annual conference.

Ikran Jama, a program participant and recent U of T graduate, says she knew from early in her university studies that she wanted to pursue a legal education. She was hesitant to apply to law school, though, until she discovered Black Future Lawyers online.

"It means so much to individuals like me who at one point didn't think law school was a viable pathway. Black Future Lawyers has been very powerful and inspiring," she says.

Jama is attending Oxford University this fall as a Rhodes Scholar, so her law school plans are currently on hold. But she intends to return to Toronto to complete a law degree and pursue a career at the intersection of her passions: law, migration and immigration. "For good reason, many members of the Black community don't trust the law or legal institutions," she says. "For this to change, we need more Black people to enter the law profession."

The firms supporting Black Future Lawyers, in addition to their funding commitment, will deliver educational sessions on business law meant to inform students about the priorities and day-to-day realities of working lawyers. These sessions will cover substantive topics in the law as well as professional advancement, such as how to build networks and improve presentation skills. "These are great avenues for students to learn directly from some of the top law firms in the country," Brunnée says.

The 14 firms who contributed to the Black Future Lawyers program are: Blakes, BLG, Cassels, Davies, Dentons, Fasken, Goodmans, Gowling WLG, McCarthy Tétrault, McMillan, Norton Rose Fulbright, Osler, Stikeman Elliott and Torys. Scotiabank has contributed $60,000 and the program is also supported by La Fondation Emmanuelle Gattuso. **–Staff**

Percentage of U of T law students who self-identify as Black: **4**

Number of U of T students who have participated in Black Future Lawyers: **469**

Number of U of T students who have been matched with Black lawyers and mentors: **134**

Other chapters of Black Future Lawyers exist at: **York, Western and McMaster universities**

PHOTOGRAPH BY SAM PIERRE

Canadian Survivors at Ohashi Prison Camp in Japan. This photo was taken by US Marines on Liberation Day, September 15, 1945. Photo provided by George S. MacDonell (1949 UC), shown in back row, 4th from left.

December 8 to 25, 1941. They fought against impossible odds.

We remember and honour their courage.

UNIVERSITY OF TORONTO

Eighty years ago, 1,973 Canadian soldiers and two nurses fought fiercely and tenaciously in the Battle of Hong Kong. Their valour, resilience and sacrifice in the face of overwhelming odds will not be forgotten. Many from U of T served in the Pacific and brought freedom when the Allies achieved victory.

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Behind the Headlines

Canadian media are becoming more diverse but racialized journalists still face barriers in the workplace that are rarely discussed, says UTM alum Pacinthe Mattar

PHOTOGRAPH BY ENZO RODRIGUEZ

A time of racial reckoning. This is how many journalists – including Pacinthe Mattar (BA 2008 UTM) – remember the summer of 2020.

The U of T Mississauga alum left CBC in 2019 after working there for a decade. In response to a tumultuous year in the media, she wrote a personal essay in *The Walrus*, sharing challenges she has faced as a racialized journalist and making a thoughtful argument for diversifying media organizations – including the leadership, which still tends to be overwhelmingly white.

Why did you pursue journalism?

I was in my final year at U of T Mississauga, and I took account of the things that I was good at and my life experiences. I'm Egyptian but I grew up in Canada, Dubai and Saudi Arabia. I've always felt kind of in-between. But I love writing, talking to people, asking questions, speaking different languages. So I did my master's degree at Ryerson and an internship at CBC, and ended up staying for 10 years.

Why did you feel it was important to write the essay for *The Walrus*?

The piece has been writing itself in my head for a decade. I had this archive of all these things that had happened, and last summer with the murders of George Floyd and Ahmaud Arbery, my colleagues and I talked about the crushing weight of it all. It was initially supposed to be a short opinion piece. I had no idea it was going to become a 5,000-word feature essay. I spent all last summer writing it.

What did you want those who read the article to take from it?

Everyone wondered why I left the CBC and I've never really talked about it. I was tired of feeling like I had to prove myself over and over again. With everything cracked open last year, I felt it was time to say all the quiet parts out loud. Our expertise is being questioned, doubted and scrutinized perhaps more than our other colleagues, but we don't talk about it openly because some part of us thinks, 'Maybe it's just me.' I was writing about my personal experiences, but this is what racialized journalists talk about.

What's next for you?

I'm going to Harvard to do the Nieman Foundation Fellowship. I proposed exploring the issues I raised in the article and dedicating myself to looking for solutions. By the grace of God, I made it in. **–Ali Raza**

←

Role model
Nicole Hannah Jones, a Pulitzer Prize-winning journalist who did the 1619 project for the *New York Times*

Book suggestion
Girl, Woman, Other, by Bernadine Evaristo

Fave UTM spot
The William G. Davis Building. It was the cultural nucleus of campus

Is it time to reset the way you protect your loved ones?

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