**Machine Music** Can computers compose? / **Lab in a Box** DNA testing for all / **Robarts TV** A faculty's experiment
**10,000 PhDs** Where they are now / **Robot Relief** Helping kids in chemo / **Greener Pastures** Farming with data

# U of T Magazine

SPRING 2018

**Faster, Smarter AI**
Clever computers are changing how we do business, practise medicine – even make music. Is there any field they won't touch?

# IT'S THE BOND THEY CREATE OFFSTAGE THAT MATTERS MOST.

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## You nurture that experience through U of T affinity products.

The Only Human Dance Collective isn't just about their big annual show; it's about building a sense of fellowship and belonging. The Collective welcomes dancers at all skill levels, giving them a place to express their creativity and bond over dance. Every time you purchase affinity products from partners like Manulife and TD Insurance, a portion of the proceeds supports dance groups and other opportunities for students to learn outside the classroom and make the most of their time at U of T.

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**affinity.utoronto.ca**

BOUNDLESS

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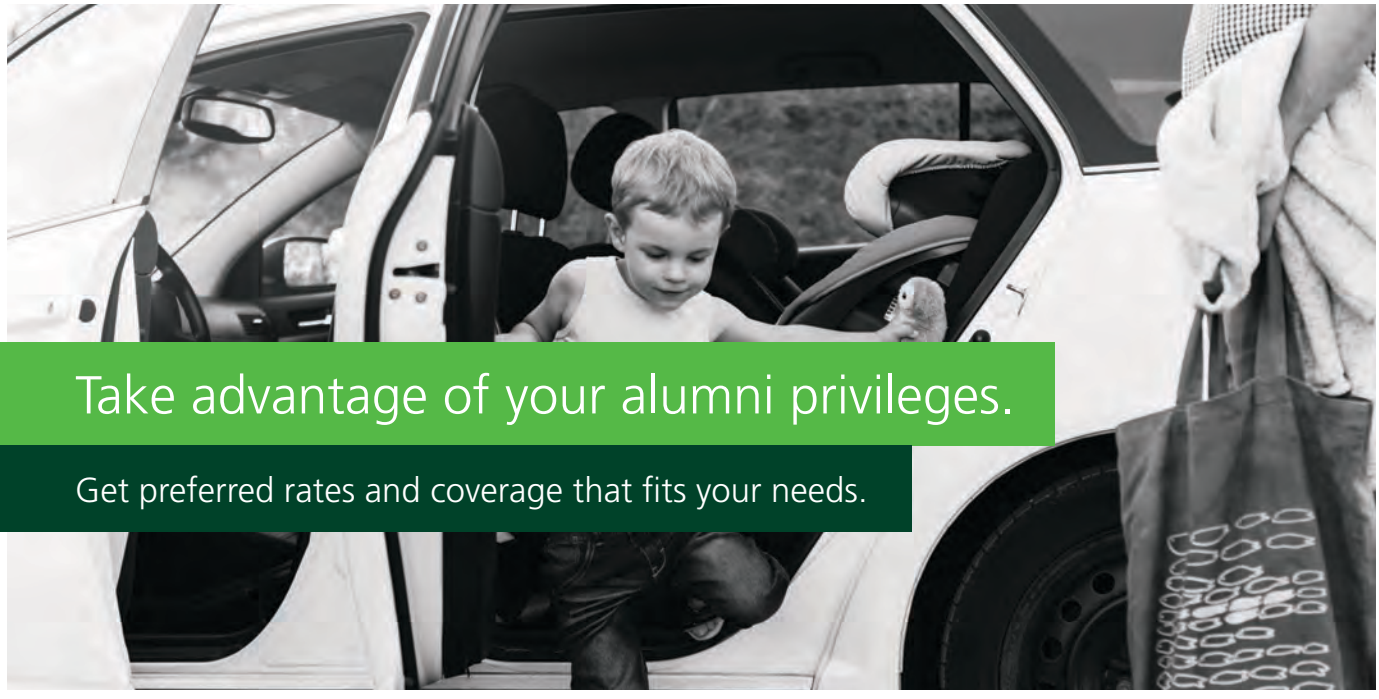

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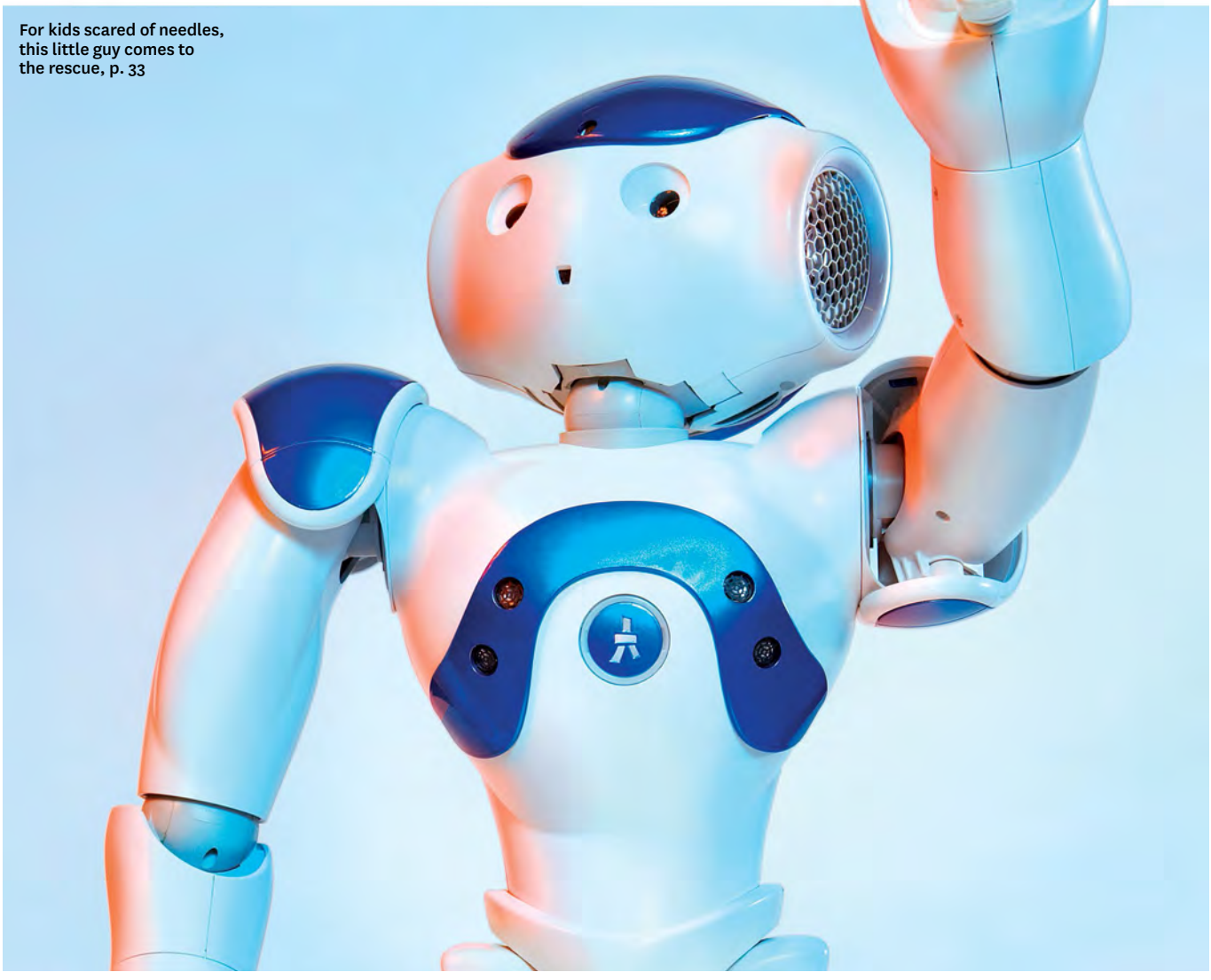
# Spring 2018

Volume 45, No. 3



For kids scared of needles, this little guy comes to the rescue, p. 33

## 26 Faster, Smarter AI

Clever computers are changing how we do business, practise medicine – even make music. Is there any field they won't touch?

**30 Alexa, Compose Me a Song**
So far, machines aren't very good at creating art, such as stories and music. Will they ever be?
BY CYNTHIA MACDONALD

**36 Bringing Sci-Fi to Life**
From virtual worlds to invisibility: seven intriguing technologies U of T scientists are working on right now

COVER: WENTING LI; ABOVE: PAUL WEEKS

UofTMagazine

**SPRING 2018** VOLUME 45 NO. 3

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UNIVERSITY OF TORONTO

## Departments

# I wanted to take a woman's experience as seriously as one would tell the story of an emperor

–Aida Edemariam, on writing a book about her grandmother's life in Ethiopia (p. 47)

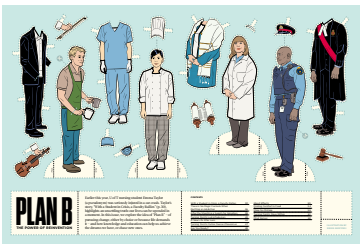
19 Using travel patterns and climate data to predict the timing and spread of epidemics

51 Judd Palmer creates dark, peculiar puppet shows that are definitely not for kids

12 The Varsity Blues held a swim meet last November against an opposing team that was thousands of kilometres away

3 **Letters** A Literary Legacy
5 **President's Message** Strength in Numbers
6 **Calendar** U of T Alumni Reunion
9 **Life on Campus** 10,000 PhDs
17 **Leading Edge** Are All Medicines Effective?
47 **All About Alumni** The Wife's Tale
56 **Time Capsule** Video Lectures

# Letters




Edna Staebler had a wonderful effect on those who met her – and she is still very much missed.

**GEORGINA GREEN**
KITCHENER, ONTARIO

Edna Staebler wrote her classic cookbook, *Food That Really Schmecks*, in her 60s

**A Literary Legacy**
Edna Staebler endowed the Kitchener Public Library with funds to appoint a writer-in-residence. I worked at the library at the time and made a yearly visit to her home on Sunfish Lake to discuss who might be offered the post. Over the years, Edna and I became friends. As suggested in your recent profile ("Finding Comfort in Food," Winter 2018), she had a wonderful effect on those who met her – and she is still very much missed. The library hosted her 85th birthday with a grand party attended by author Pierre Berton and more than 200 fans. A fundraiser, the Edna Staebler Golf Classic, held in October 2006, went ahead as planned even though Edna died on Sept. 12. We all felt she would have wanted that.

**GEORGINA GREEN**
KITCHENER, ONTARIO

**Alternate Career Paths**
I loved the inspirational story about Rena Arshinoff ("A New Life after Loss," Winter 2018), who left the medical field to become a rabbi. It made me think of my daughter, who has finished one degree and is now working through her second. Like so many young adults, she needs to know that she can explore more than one career path and not be afraid to do so.

**JOYCE THOMAS**
BPHE 1990, BEd 1993, COURTICE, ONTARIO

**A Beautiful Story**
Regarding the winner of last year's *U of T Magazine* short story contest, "Fanny & Keats": I never knew a story could be so beautiful, entertaining and satisfying. Well done!

**LESLEE MORDAUNT**
BSc PT 1986, NEDLANDS, AUSTRALIA

**Write to us!**
*U of T Magazine* welcomes letters at uoft.magazine@utoronto.ca. Read the Winter 2018 issue online at magazine.utoronto.ca/winter-2018.

**Tweets from readers about our Winter 2018 issue**

Several expressed admiration for Edna Staebler, the author of *Food That Really Schmecks*…

**I love Edna Staebler's cookbooks, and I love this @uoftmagazine article.**
Rachel Bee @hufflepunked

…and for MP and U of T alumna Celina Chavannes.

**Inspiring stuff! I did all right in school but never felt too confident. Stories like Celina's help me keep my head up for opportunities I wouldn't otherwise consider.**
Alex Reino @alexreino

**The more I learn about @MPCelina the more inspired I get. Read this awesome profile in @uoftmagazine.**
Elyse SuretteDiMuzio @elysesd_

Celina Chavannes

The story of a nursing student who was determined to graduate following a serious car accident impressed many readers…

**Fantastic story about the challenges and support for the nursing student! Kudos to her, and thank you for sharing. Very powerful what reality can show us!**
Linda Hunter @lhunter1310

**@UofTNursing is an incredible program with very caring professors. This is just one example of its amazing faculty. #nursingstudent #UofT #bloombergnursing**
Emily Burnham @EmilyGGB29

…as did the efforts of a group of U of T–affiliated hospitals to eliminate medical errors.

**Thanks to @uoftmagazine for the thorough and thoughtful piece by Marcia Kaye on the @UHN Caring Safely Transformation. Great overview.**
Daniel Girard @danrgirard

President Meric Gertler's trip to Africa drew praise…

**I'm glad President Gertler had a chance to see the great work done by many who are part of the Toronto Addis Ababa Academic Collaboration.**
Lynn Wilson @drlynnwilson

…as did the work of alumna Eileen de Villa, Toronto's medical officer of health.

**Wonderful to see our @epdevilla featured in @uoftmagazine discussing social determinants of health and key public health issues facing Toronto, including opioids and homelessness.**
Adalsteinn Brown @SteiniBrown

**I was fortunate to work with Eileen de Villa when she was a med student. I'm not surprised at her great success!**
Lynn Wilson @drlynnwilson

There was also a nod for Marc Lewis's insight into addiction and recovery.

**I agree that thinking of addiction as a disease can create a false sense of powerlessness.**
Ryan Reed @RyanMaynorReed

**Join the conversation on Twitter @uoftmagazine.**

## Top stories from Winter 2018

BY VIEWS

**With a Student in Crisis, a Faculty Rallies**

In an instant, a car crash dashed Emma Taylor's hopes of becoming a nurse. Her struggle to graduate on time, as told to *U of T Magazine* deputy editor Stacey Gibson, illustrated her determination – and the willingness of her classmates and teachers to help.

BY COMMENTS AND FACEBOOK LIKES

**Finding Comfort in Food**

Deputy editor Stacey Gibson tells the inspiring story of alumna Edna Staebler, who was 55 when her marriage ended. She thought she would grow old alone, impoverished and unhappy, but then she wrote a cookbook.



PHOTOS: LEFT, COURTESY OF CELINA CHAVANNES; MIDDLE, LORNE BRIDGMAN; RIGHT, COURTESY OF MASTERCARD FOUNDATION SCHOLARS PROGRAM

# Strength in Numbers

## Our first-ever Alumni Impact Survey reveals that U of T alumni are making massive social, cultural and economic contributions around the world

As a social scientist, I get pretty excited when a data set is able to shed new light on important human phenomena or help us answer compelling questions.

That's how I felt when I saw the initial findings from the University of Toronto's first-ever Alumni Impact Survey. We already knew, based on the wonderful stories we hear on a daily basis, that our graduates make a difference for the better in so many fields of human endeavour. But now, as a result of this major academic study – which deployed rigorous, cutting-edge survey methodology – we can actually measure the social, economic and cultural contributions of our global community of more than half a million alumni.

Traditionally, universities have gauged their impact in rather narrow economic terms, based on tracking the expenditures made by their faculty, students and administration. The idea of undertaking more comprehensive alumni impact surveys is quite new, and the scope of such studies continues to evolve. In 2015, Harvard University's study surveyed aspects of their graduates' social impact, measuring activities such as volunteer hours and service on boards.

With our own study, we have broken new ground by providing an even more comprehensive picture of alumni contributions. We have broadened the scope of our inquiry by including additional categories of social impact such as mentorship, and by measuring the full array of cultural outputs produced by our graduates. It's an appropriate accomplishment, given our global standing as a research and innovation powerhouse. Special credit for these crucial innovations goes to Professor Vivek Goel, U of T's vice-president of research and innovation, and Professor Shiri Breznitz of the Munk School of Global Affairs, who co-directed the study with the assistance of an independent research firm.

So what have we learned? Here are a few highlights of the initial findings: More than half of our alumni serve as volunteers for a range of causes and institutions – on average for 15.4 hours per month – and 62 per cent of our alumni serve as mentors in their workplaces and communities. Though we recognize many famous novelists, filmmakers and other cultural leaders who have graduated from U of T, the survey reveals that in total our alumni have created more than 89,000 works of literary, performing or visual art for public consumption. When it comes to leadership in the business world, our graduates have founded some of Canada's best-known firms. In addition, our survey results reveal that one in four U of T alumni has founded at least one company or not-for-profit organization, and in total these enterprises currently generate $368 billion US in annual revenue and employ 3.7 million people around the world.

Over the next several months we'll continue to unpack and analyze the survey data. Later this spring, we'll launch a website – alumni.utoronto.ca/alumni-impact-survey – to provide updates on the major themes that are emerging. Whether you're a startup founder, a playwright, a coach at your neighbourhood rec centre or one of the tens of thousands of professionals, public servants and knowledge workers among our graduates, I believe you'll be impressed, and even more proud of your association with the University of Toronto.

We're very grateful to the large number of alumni who completed the survey, ensuring we would have the wealth of data required to produce a study of the highest academic quality. Ultimately, they and their fellow alumni are the ones responsible for the great story we're now able to tell, allowing us to document more fully how the U of T community serves as a force for good in our society.

*Sincerely,*
Meric Gertler

# Calendar

**MORE EVENTS!**
Check out the latest campus happenings at **utoronto.ca.**

Alumni Reunion welcomes recent grads to Spring SHAKER at Canada's Wonderland, May 30

**MAY 30 TO JUNE 3**

## U of T Alumni Reunion

This year's U of T Alumni Reunion features more than 130 events. If you graduated in a year ending in a 3 or an 8, please visit the website below to learn about the events hosted in your honour by your college, faculty or department, as well as U of T–wide celebrations. While honoured alumni are special guests, all U of T alumni are welcome. Events include Spring Shaker at Canada's Wonderland for recent grads; Stress-Free Degree lectures by U of T profs and instructors; LGBTQ Spring Soiree; campus tours and more. Additional events are listed, beginning on this page, under "U of T Alumni Reunion."

For more info on all Alumni Reunion events, visit **alumnireunion.utoronto.ca** or contact **1-888-738-8876** or **alumni.reunion@utoronto.ca** unless otherwise indicated.

### Alumni

**May 3**
**Australia**
**The Medium is the Medicine: Stories and Work of Reconciliation in Canada** for U of T alumni and friends. Reception, and presentation by U of T prof Pamela Klassen of the Study of Religion. Free. 5:30–7:30 p.m. Queen's College, University of Melbourne. Register at alumni.utoronto.ca/events-and-programs/upcoming-events.

**May 7**
**New York**
**President's Reception and Presentation.** Hosted by President Meric Gertler, for University of Toronto alumni and friends. Lecture by Prof. Mark Kingwell on ethics in AI. Free. 7–9:30 p.m. Metropolitan Club New York, 3rd floor, 1 E 60th St. For information and to register, please visit alumni.utoronto.ca/events-and-programs/upcoming-events.

### U of T Alumni Reunion

For more information about all Alumni Reunion events, visit alumnireunion.utoronto.ca or contact 1-888-738-8876, 416-978-5881 or alumni.reunion@utoronto.ca unless otherwise indicated.

**May 30**
**Canada's Wonderland**
**Spring SHAKER.** A private party with exclusive access to rides and games for new and newish U of T grads. A 19+ event. Non-alcoholic beverages, treats and one drink ticket. $25. 7–10:30 p.m. 1 Canada's Wonderland Dr.

**May 30**
**U of T Mississauga**
**UTM Alumni Association Annual General Meeting.** Exclusive for UTM alumni. Come hear what the UTMAA is doing now and planning for the coming year. Free. 6 p.m. William G. Davis Building, Rm 3140, 1867 Inner Circle. 905-569-4924, alumni.utm@utoronto.ca or utm.utoronto.ca/alumni.

**May 30**
**U of T Mississauga**
**Classes Without Quizzes.** Featuring Prof. Kent Moore, an expert on the physics of climate change. Free. 7 p.m. William G. Davis Building, Rm 3140, 1867 Inner Circle. 905-569-4924, alumni.utm@utoronto.ca or utm.utoronto.ca/alumni.

**May 31**
**St. George Campus**
**Stress-Free Degree lectures.** Attend lectures by U of T professors without worrying about homework or exams. Free. 6–7 p.m., 7:15–8:15 p.m. 15 King's College Circle, 1 Devonshire Place and 78 Queen's Pk.

**May 31**
**The One Eighty, Toronto**
**LGBTQ Spring Soiree.** Pre-Pride party for all LGBTQ alumni. Free. 6–9 p.m. 51st floor, Manulife Centre, 55 Bloor St. W.

**May 31**
**University College**
**Alumni Reunion Stress-Free Degree at UC.** "Estrogens and the Brain: What is known about their role in healthy aging?" presented by Dr. Gillian Einstein. Free. 6–7:30 p.m. Rm 140, 15 King's College Circle. 416-978-2968 or uc.alumni@utoronto.ca.

**June 1**
**Convocation Hall**
**Chancellor's Circle Medal**



PHOTO: PAUL TEREFENKO

***Axe|Exa|Axi*, part of the exhibit "Robert Fones: Signs | Forms | Narratives," at the U of T Art Museum starting May 16**

**Ceremony.** Honouring alumni marking their 55th, 60th, 65th, 70th, 75th and 80th anniversaries. Free. 9:30–11 a.m. with reception afterward. Registration: 9 a.m. 31 King's College Circle.

**June 1**
**Sidney Smith Hall**
**Stress-Free Degree lectures.** Attend lectures by U of T professors and instructors without worrying about homework or exams. Free. 12–1 p.m., 4–5 p.m. and 6–7 p.m. 100 St. George St.

**June 1**
**Convocation Hall**
**50th Anniversary Ceremony.** Honouring alumni celebrating their 50th anniversary of graduation. Free. 1:30–3 p.m. with reception afterward. Registration 1 p.m. 31 King's College Circle.

**June 1**
**University College**
**UC Class of 1968 50th Anniversary Lunch.** Reunite with UC classmates to celebrate the 50th anniversary of graduation, before the U of T medal ceremony in Convocation Hall. Free. 11:30 a.m.–12:30 p.m. Bissell House, 15 King's College Circle. 416-978-2968 or uc.alumni@utoronto.ca.

**June 1**
**U of T Mississauga**
**Flicks on the Field.** Enjoy an outdoor movie under the stars with other UTM alumni and families as part of Alumni Reunion. Free. 9 p.m. Communication, Culture and Technology Building Courtyard. 1800 Middle Rd. 905-569-4924, alumni.utm@utoronto.ca or utm.utoronto.ca/alumni.

**June 2**
**St. George Campus**
**Kids' Passport to U of T.** Kids can visit University of Toronto departments, buildings and labs to do cool things and see what it's like to attend Canada's top university. Free. 9:30 a.m.–12:30 p.m.

**June 2**
**Sidney Smith Hall**
**Stress-Free Degree lectures.** Attend lectures by U of T professors without worrying about homework or exams. Free. 9:45–10:45 a.m., 2:30–3:30 p.m. and 3:45–4:45 p.m. 100 St. George St.

**June 2**
**St. George Campus**
**Campus Bus Tours.** Free. Every hour from 10 a.m. to 3 p.m., except at noon. Bus departs from 23 King's College Circle.

**June 2**
**Convocation Hall**
**Alumni Celebration sponsored by the U of T Alumni Association.** Keynote address by Jennifer Keesmaat, former chief planner, City of Toronto, and brief annual general meeting. All alumni welcome. Free. 11 a.m.–12:30 p.m. 31 King's College Circle.

**June 2**
**St. George Campus**
**Alumni BBQ for alumni, family and friends.** Free. 12:30–2:30 p.m. Front Campus tent. King's College Circle.

**June 2**
**Medical Sciences Building**
**UofTMed Inside the Issue.** A talk for U of T alumni and friends about *UofTMed* mag's latest issue. Speakers will delve into legalization of recreational use of cannabis. 2–3:30 p.m. Rm 315, 31 King's College Circle. 416-978-7142 or medicine.rsvp@utoronto.ca.

**June 2**
**Location TBA**
**SHAKER Educational.** Attend a lecture by a U of T professor followed by a fun activity and reception. For new and newish U of T grads. Free. 3:45–6:30 p.m.

**June 2 and 3**
**U of T Scarborough**
**UTSC Alumni Reunion.** Rediscover UTSC. Sit in on a talk from a favourite prof at our Classes Without Quizzes, take a campus tour, enjoy delicious food and much more. Free. Various times. 1265 Military Trail. alumni@utsc.utoronto.ca.

## Exhibitions

**May 16 to July 21**
**Art Museum at the University of Toronto**
**Robert Fones: Signs | Forms | Narratives.** A career-spanning survey of works by the Toronto-based, Governor General's Award–winning artist and writer. Free. Tues. to Sat., 12–5 p.m. Wed. to 8 p.m. U of T Art Centre, 15 King's College Circle. 416-978-1838. artmuseum.utoronto.ca.

**May 21 to August 31**
**Thomas Fisher Rare Book Library**
**Mixed Messages: Making and Shaping Culinary Culture in Canada.** How the culinary culture of Toronto and surrounding areas was shaped by those who participated in – or were excluded from – the making and using of culinary materials. It will include rare cookbooks, manuscripts and culinary objects from the 1820s to the 1960s. Free. 120 St. George St. Mon. to Fri., 9 a.m.–5 p.m. 416-978-5285, fisher.library@utoronto.ca or fisher.library.utoronto.ca.

## Lectures and Symposia

**May 4**
**U of T Scarborough**
**UTSC Leader2Leader Conference.** A day-long series of workshops and panel discussions featuring leaders from various fields. Open to all U of T alumni. $30 (early bird). 9 a.m.–5 p.m. Instructional Centre, 1095 Military Trail. utscleader2leader.com.

**May 16**
**Rotman School of Management**
**Understanding Booms and Busts in Housing Markets.** Housing economists discuss the forces governing housing markets and risks and opportunities for market participants. $25 plus HST. Talk: 5:30–6:30 p.m. in Desautels Hall (South Building). Reception: 6:30–7:15 p.m. in Fleck Atrium (North Building). 105 St. George St. To register and for info: 416-978-6119, events@rotman.utoronto.ca or rotman.utoronto.ca/ProfessionalDevelopment/Events.

**May 23**
**Rotman School of Management**
**Jacqueline Carter and Rasmus Hougaard.** The Potential Project directors discuss their new book, *The Mind of the Leader: How to Lead Yourself, Your People, and Your Organization for Extraordinary Results*. $38.99 plus HST (includes one seat and book). 5 p.m. Desautels Hall (South Building), 105 St. George St. To register: 416-978-6119, events@rotman.utoronto.ca or rotman.utoronto.ca/ProfessionalDevelopment/Events.

## Special Events

**June 8**
**Hart House**
**U of T Pride Pub.** Organized by U of T's Sexual and Gender Diversity Office. Price TBA. 4:30 p.m.–1 a.m. Hart House Quad. 7 King's College Circle. 416-946-5624, sgdo@utoronto.ca or sgdo.utoronto.ca/event/2018-u-t-pride-pub.

## Sports

**May 31**
**Goldring Centre**
**U of T Varsity Blues Sports Hall of Fame Induction Ceremony for 2018 Inductees.** Honouring U of T's greatest athletes and builders. Business attire. Adults: $40. Children 12 and under: free. Reception: 6 p.m. Ceremony: 7 p.m. Field House, 100 Devonshire Pl. 416-946-5126, alumni.kpe@utoronto.ca or halloffame.utoronto.ca.

PHOTO: AGNES ETHERINGTON ART CENTRE, QUEEN'S UNIVERSITY. GIFT OF ROBERT FONES.

# HOW COULD THIS BE MORE BEAUTIFUL?

Exploring the world with like-minded people makes the experience all the more vivid. The University of Toronto Alumni Travel Program offers wide-ranging opportunities to connect with alumni and other travellers who share your sense of adventure. These tours criss-cross the globe. They're always fascinating, enriching and meticulously planned—down to every detail and flavour. What will turn your trip into a journey are the people you meet along the way.

**Curious about this striking destination?**
Visit the website to read about Fogo Island and all 35 alumni trips for 2018.

alumnitravel.utoronto.ca
1-800-463-6048 or 416-978-2367

UNIVERSITY OF TORONTO

BOUNDLESS

# Life on Campus

**"There's an entrepreneurial revolution going on"**
Student Ayisha Lineo Gariba, who started her own company at age 12
**p. 11**

A first-ever U of T study of 10,000 recent alumni with PhDs found that 2015 grads were almost twice as likely as 2000 grads to enter the private sector

## What You Can Do with an Advanced Degree

Many recent PhD grads are professors, but a growing number, especially in the sciences, have landed jobs in the private sector

**WHERE DO I GO** from here? It's a question all students ask themselves as they approach graduation – and it's particularly important for those who have devoted five or six years to a PhD.

The answer, it turns out, is "you can go anywhere."

In a first-ever survey of PhD graduates from U of T, the School of Graduate Studies found that alumni who graduated between 2000 and 2015 work in 97 countries, and have a vast range of job titles, from creative director to neurosurgeon.

Although six in 10 alumni with PhDs still land jobs in academia (a third of the total with tenure-stream positions), a growing number are taking work outside of universities. Among 2015 grads, 23 per cent were employed in the private sector, for example, compared with just 13 per cent of 2000 grads. (Science graduates were more likely than humanities or social science grads to enter the private sector.)

Case in point: Michael Selvanayagam did his PhD at U of T in electrical engineering and now works for a quantum- ›

PHOTO: JOHNNY GUATTO

computing startup in Berkeley, California. Likewise, Inmar Givoni did her PhD on a topic related to artificial intelligence and now works for Uber as an "autonomy engineering manager."

"Partly what we see in the results is the wide variety of job options that PhD students' futures might hold," says Joshua Barker, dean of the School of Graduate Studies.

Researchers at the school compiled the data using Internet searches of public sources, such as university and company websites, to determine where a U of T PhD grad was employed. They found the professional outcomes of nearly 10,000 former students, or 88 per cent of graduates, over the 16 years covered by the study.

The top five private employers? Google, Intel, Janssen Pharmaceutica, RBC and Scotiabank. In the public sector, the top destinations for PhD alumni included the University Health Network, the Hospital for Sick Children and the Centre for Addiction and Mental Health.

Recognizing a need to help grad students broaden their career prospects, the School of Graduate Studies supports professional development initiatives led both by students and faculty. Often these are tailored to a specific department or faculty, and include career talks by alumni, sessions on project management and other job-related skills, and internships. In July, a new vice-dean will work to expand the Graduate Professional Skills Program and create career development opportunities for grad students across all three campuses.

Barker, whose own PhD focused on Indonesia during the dictatorship of the 1990s, says U of T graduates with advanced degrees are well positioned to find jobs in new and dynamic fields. "Toronto is emerging as one of the hubs of the knowledge economy, and the specialized training PhDs acquire can play a big part in expanding innovation locally and globally," he says.

The study is not the only good news U of T has received about the future prospects of its graduates. Over the past several years, the university has consistently led other Canadian institutions in Times Higher Education's global university employability rankings.

– GEOFF VENDEVILLE

IN CASE YOU MISSED IT

## Night Owls Unite

### An all-night event at Hart House celebrated sleep – and the lack of it

Cameron Reed (BA 2015 Trinity) catches some zzzs next to Liz Magor's artwork "Burrow"

**IN JANUARY**, U of T hosted the ultimate pajama party: Night of Ideas, an all-night international art event. Held at Hart House and U of T's Art Museum, the university is one of the first Canadian institutions to take part in the festivities – held in more than 50 cities throughout the world.

At the Art Centre, visitors checked out the Figures of Sleep exhibit – which reflected on the cultural anxieties of slumber. Visual artist Nicole Crozier captured this shot of her boyfriend, Cameron Reed (BA 2015 Trinity), next to Liz Magor's piece "Burrow." Over at Hart House, pajama-clad attendees sashayed down a runway to Madonna's *Vogue* in a PJ pageant. There was also a midnight swim in the Hart House pool, a crafting session to create sleep masks in the Great Hall, roundtable discussions, dance performances and live music.

"Hart House is a magical place for an all-nighter. We have the fireplace. We have the pool. There's food and drink," says Barbara Fischer, executive director and chief curator of U of T's Art Museum and one of the event organizers. And possibly most importantly? "There are couches to nap."

PHOTO: NICOLE CROZIER

"There's an entrepreneurial revolution going on," says Woodsworth College student Ayisha Lineo Gariba, 19, who started a business at age 12

P.O.V.

# Off Script

## U of T student Ayisha Lineo Gariba doesn't play by the rules – while making films or while running her business

**AT 19**, U of T student **Ayisha Lineo Gariba** has already spent a third of her life running a successful business. As a preteen in her native Ghana, she started The Bacon Berry Card Co. to sell handmade birthday cards. Since then, she's branched out into documentary filmmaking – she explores issues surrounding race, gender and sexuality – as well as graphic design and photography, all while meeting the demands of being a second-year student in women and gender studies at Woodsworth College. Here, Gariba talks to **Cynthia Macdonald** about how to be a creative force in the new economy.

**What I study informs every aspect of my work.** My feature film, *The Hallmark of Tolerance,* is about anti-black racism and white supremacy in the Canadian landscape, and my social justice studies contributed to my understanding of these issues. So when I do panels and screenings now I talk about things I learn in school. I haven't shared *The Hallmark of Tolerance* widely, because I like it to be accompanied by a discussion afterwards; I was able to do that at a recent screening of the film at Hart House. I don't want anyone to watch this film and then say: 'What do I do with these feelings now?'

**You can start a business at any time.** I made a birthday card for my friend when I was 12. It was pretty intricate, like a pop-up card on springs. People started requesting cards, and I saw potential to make some money. That was the beginning of The Bacon Berry Card Co. Since moving to Canada in 2013, I've learned graphic design and now make bookmarks, art prints, stickers, colouring booklets and posters. The money I earn goes into other projects, such as films.

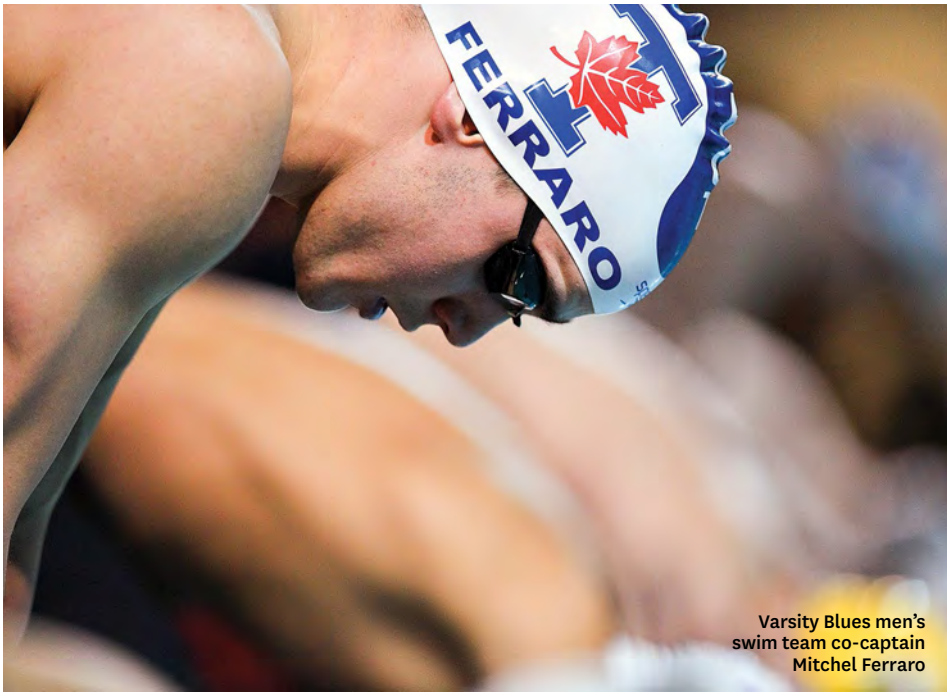
There's an entrepreneurial revolution going on. A friend of mine started his first business at 20 and now has a digital record label. Musician friends who use his platform don't have to wait around for an established record label or agent to say hey, we're going to put you in the big leagues and take all your money. They can record something at home and access data that shows who's listening to their music.

**You're never too young to think about finance.** From a very young age I was strategizing how to make more money from my allowance. If my parents or siblings needed immediate cash – online payment isn't common in Ghana – I'd lend it to them. But I'd make sure it was close to the weekend when the bank was closed. That way I could stretch out their loan period, and collect more interest.

**Think outside the rectangle.** I remember getting into a small argument with my business teacher about business cards. Why do they have to be rectangular and contain the information they do? I don't have a fax number! My cards are bright pink and square. Cards don't need to be in wallets; we have enough cards in there. I take a picture of people's cards and archive them on my phone.

**Be as proud as you are humble.** It's important to give yourself the credit you deserve, but I also acknowledge my privilege. I attribute a lot of the success I've had to my parents, who met in graduate school and have worked very hard to make sure their children had more opportunities than they did. Historically, black women have not been paid properly for the work that they do. Deep down inside, I'm making art for another version of myself who couldn't.

PHOTO: EUGENE SAKHNENKO AND BECCA GILGAN




Varsity Blues men's swim team co-captain Mitchel Ferraro

## The (Virtual) Shape of Water

Varsity Blues swimmers competed against Britain's Loughborough University in November – but neither team left their home country.

It was the Blues' first virtual competition, with each team swimming the *same* events in the *same* order on the *same* weekend while the scores were posted electronically. The Loughborough team edged out both the Blues men and women, but the Blues produced some excellent times. (U of T student and world champion swimmer Kylie Masse set a new Varsity record by nearly three seconds.)

"It was both exciting and stressful, since racing an opponent who isn't there shifts the pressure to racing the clock and hoping for the best," says men's Blues co-captain Mitchel Ferraro.

The idea for the electronic meet evolved out of a friendship between Loughborough's head coach and Blues head coach Byron MacDonald. "Loughborough is home to some of the best swimmers in the U.K.," says MacDonald. "We knew we would have a major challenge."

Plans are now in the works to turn the virtual meet into a physical meet, with Loughborough hosting the Blues this fall. "It'll be a thrilling opportunity to race the people behind the virtual times," says Ferraro. – **MEGAN EASTON**

### SOUND BITES

What song takes you back to your university days?

**"Bobcaygeon," hands down. Everyone I knew was a @thehipdotcom fan. Everyone I *didn't* know was a Hip fan. The morning of my last exam, I woke up early and this was on the radio – and it was like a goodbye to university. I always think of that morning when I hear the song.**
@bmaynards5

**"Rocket Man" by Elton John, 1972.**
@quist

**"Maggie May" by Rod Stewart. It takes me back to Victoria College in 1971 every time I hear it.**
@UTSCMGTB90

**"Glory Days" by Springsteen.**
@renodane

Join the conversation at twitter.com/uoftmagazine.

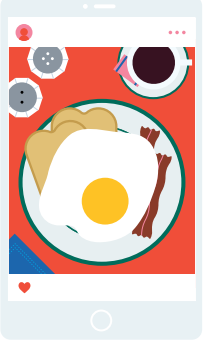
## Poll | Have you ever done a digital detox?

With concerns mounting about the addictive power of smartphones, we asked U of T students if they're able to take time off from the Internet. Most say they can't – and for some their education is a reason why: "A lot of courses have a Facebook group, so I feel if I were ever to try to unplug, I'd be missing stuff relevant to my coursework," says Sydney Caskenette, a fourth-year student majoring in psychology and neuroscience.

About 50 per cent of the students who did disconnect did so involuntarily while travelling in areas without reception. Most of the other digital detoxers (35 per cent of whom lasted only a day or less) unplugged to focus on their studies or manage stress. "I've tried it because social media has too much of an impact on my life and my emotions," says Aliana Razac, a first-year life sciences student, who, like many of her peers, says she compares her own life to the "perfect" ones she sees on social media. – **SALLY CHOI**

**This highly unscientific poll of 100 U of T students was conducted on the St. George campus in February.**

35%
**Yes**



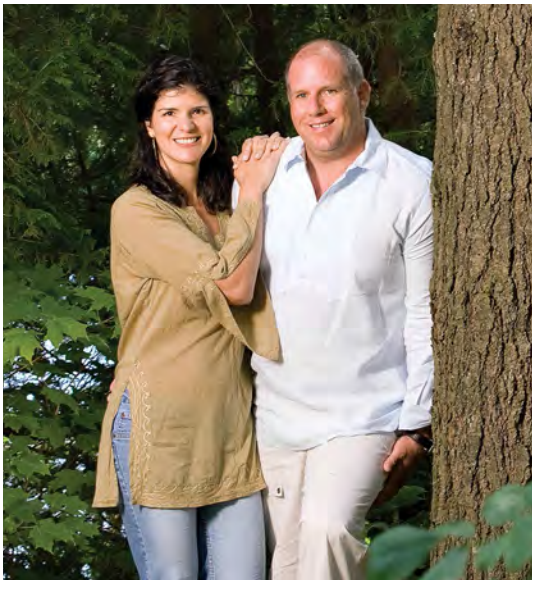
65%
**No**



PHOTO: MARTIN BAZYL; ILLUSTRATION: ALINA SKYSON

## Twice the Impact

### Paul and Alessandra Dalla Lana give U of T a second $20 million for public health and health-care systems



**ALMOST A DECADE** after making a $20-million gift to establish the Dalla Lana School of Public Health at the University of Toronto, Paul and Alessandra Dalla Lana are doubling down on their investment.

Earlier this year, the couple announced they are making an additional $20-million gift to the school. "It's been amazing to see the impact research conducted at the school is having on critically important but often overlooked public-health and health-system issues across Canada and globally," says Paul Dalla Lana, who founded NorthWest Healthcare Properties REIT – the largest private owner and manager of medical buildings in Canada.

In the years since the couple's original donation – the largest gift ever to public health in Canada – the faculty has grown into a global leader in the field, and is at the forefront of research to promote health and prevent disease. Its scholars have made significant contributions to a range of critical issues, from how to control the surging incidence of chronic illnesses such as diabetes, to the safety and effectiveness of hospital and home care, to how to pay for Canada's health system.

The Dalla Lana family's original gift fuelled this growth through the creation of scholarships, four endowed chairs and a dean's fund. The new donation will provide funding for initiatives to improve the health-care system, devise innovative policies and create healthier communities.

Dr. Daniel Pincus, a PhD candidate in clinical epidemiology, is one of almost 1,000 Dalla Lana School of Public Health students. He studies wait times and health outcomes for hip surgery patients. Prof. Laura Rosella, the Canada Research Chair in Population Health Analytics, studies how life expectancy is affected by factors such as food insecurity and poverty. Prof. Prabhat Jha, the Endowed Chair in Disease Control (which is funded by the Dalla Lana family's original gift), is studying how people in India die – in order to understand better the health of the living. Suzanne Stewart is a professor and director of the Waakebiness-Bryce Institute for Indigenous Health, which aims to improve the health of Indigenous peoples in Canada.

Students and faculty at the school are deeply involved in the community and across the health-care system. Many students hold down jobs as clinicians and managers while completing their studies. Last year, students created healthy menus for more than 25 drop-in centres across Toronto and recently hosted 130 students from Ontario universities for a public-health case competition tackling air quality and health.

**– JENNIFER LANTHIER**

## Why I Give

Edwin Leong

**Attracting Top International Grad Students to U of T**

Edwin Leong (MSc 1974) is the chairman of Tai Hung Fai Enterprise Company, a real estate development firm he founded in Hong Kong in 1977. Recently, he established the Edwin S.H. Leong Scholarship, which will award $55,000 a year to each of two international students for entry into a U of T graduate program in science, physics, management, math or computer science.

**Edwin Leong**: My philanthropy is rooted in gratitude. Looking back, I feel that learning in a diverse environment at U of T was an important aspect of my maturity, and helped as I started my own business in my late 20s. My graduate degree gave me a solid foundation, and I give back to the university to ensure that outstanding students who are in need of support have similar opportunities. I'm delighted to see many successful alumni working in Hong Kong and contributing to the community. U of T's strong international reputation continues to grow, and my graduate scholarship is intended to help attract the best and brightest students from around the globe to U of T.

PHOTO: LEFT, COURTESY OF OFFICE OF ADVANCEMENT, FACULTY OF MEDICINE; RIGHT, COURTESY OF EDWIN LEONG

IN MEMORIAM

# Editor Extraordinaire

## Francess Halpenny helped turn U of T into an academic publishing powerhouse

**WHEN FRANCESS HALPENNY** – a longtime senior editor at U of T Press and an editorial force behind the *Dictionary of Canadian Biography* – was a high school student in Toronto, she barely scraped through the mathematics requirements, but she excelled at English. With a scholarship, she enrolled at University College in 1936 in a newly created English language and literature program, where she became enamoured with 19th-century literature.

Halpenny, who died in December at the age of 98, would go on to use her impressive English skills to help cement the University of Toronto as a centre of academic publishing. After graduating in 1940, she joined U of T Press in 1941, performing editorial roles there for almost half a century and shepherding into print such important works as Marshall McLuhan's *The Gutenberg Galaxy.* She built a team of highly skilled editors, says Ian Montagnes, one-time editor-in-chief of the press, "but she believed that the editor's work should be invisible."

Halpenny's biggest mark in publishing may have been as the editorial director of the *Dictionary of Canadian Biography,* a highly ambitious, bilingual project developed by U of T Press and Laval University. Its first volume was published in 1966, and Halpenny took over as general editor in 1969, steering its operations until 1988.

In parallel with her editorial work, Halpenny served as dean of the Faculty of Library Science (now the Faculty of Information) for six years in the mid-1970s – and was "an incredible force of nature," says current dean Wendy Duff. While Halpenny was dean, she had lunch with every student in the faculty (usually in small groups) to make sure she got to know each one, says Duff. "She touched the lives of every single student."

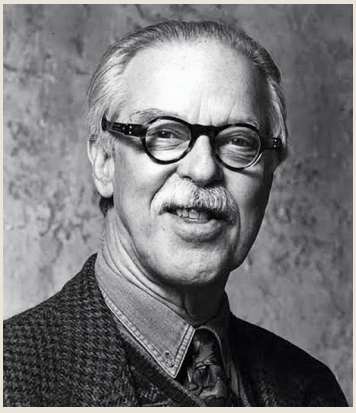
Halpenny also had a storied life outside the university: early in her career, she left U of T Press for a time to join the Royal Canadian Air Force. After basic training, she was posted to a meteorological office north of St. John's where she issued weather forecasts to help guide Allied aircraft and warships. "I felt very strongly that everybody's effort was needed," she said.

As an undergrad, Halpenny developed a love of theatre, joining the UC Players' Guild and performing at Hart House Theatre. She remained deeply interested in the arts throughout her life. She would take her nieces and nephews to the Stratford Festival. She also set up accounts for them at Britnell's bookstore in Toronto so they could pick up books whenever they wanted, says her niece Jane Loughborough.

Her nieces and nephews were only vaguely aware of Halpenny's importance in the publishing industry, says Loughborough. Eventually, however, as accolades began to roll in, including 11 honorary degrees and the Order of Canada, it became clear to the family how highly she was regarded. "We had a sense of her stature and her interests, but not of the accolades. She was so humble." – **RICHARD BLACKWELL**

IN MEMORIAM

# Martin Hunter



When Martin Hunter – who died in November at the age of 84 – took the helm as artistic director of Hart House Theatre in 1972, he returned to his first love of the stage.

As a boy, he was a member of the Toronto Children's Players theatre troupe and, as a U of T student, acted in Trinity College productions. After graduating with a BA in 1955, Hunter took a post with the Department of External Affairs and later joined the family business, Buntin Reid Paper Company. On the side, he wrote plays. He also performed in and directed productions with theatre groups such as the University Alumnae Dramatic Club (now the Alumnae Theatre Company). In 1968, he became the playwright-in-resident at U of T's Graduate Centre for the Study of Drama.

Under Hunter's leadership, Hart House Theatre became a teaching hub that brought together students and seasoned performers. He believed the best place for aspiring actors to learn was in the thick of productions, and his wide-ranging programming allowed them to tackle everything from Shakespeare to musicals. "It was a very important place for him creatively," says his daughter, Sarah Hunter. "He especially loved sharing his knowledge with students."

Hunter's directorship at Hart House Theatre ended in 1978, but he remained connected to its people and productions, staging his last original work there in 2011: *The Gentleman Caller,* based on the life of Tennessee Williams. – **MEGAN EASTON**



PHOTO: LEFT, UNIVERSITY OF TORONTO ARCHIVES AND ROBERT LANSDALE PHOTOGRAPHY (ACCESSION A2012-0009/011 (17)); RIGHT, BERNARD LEROUX

UNIVERSITY OF TORONTO

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BOUNDLESS

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# Leading Edge

**"Increasingly, it isn't about a *new* virus outbreak, but trying to figure out how those we already know about will expand into new territories"**

U of T prof Isaac Bogoch on predicting epidemics
**p.19**

## Many Medicines Are Considered Essential. Not All Are Effective

### A U of T doctor is leading efforts to review the medical evidence for more than 2,200 commonly prescribed drugs

**WHEN TORONTO RESEARCHER** and family doctor Nav Persaud found no scientific evidence that the common morning-sickness drug Diclectin, widely prescribed in Canada over the past 40 years, is effective, he had a startling realization. "I began to wonder, are there other common medications that might be ineffective also?" Persaud, a professor in U of T's department of family and community medicine and a staff physician and scientist at St. Michael's Hospital, headed up a small team of researchers to find out.

They began by drawing up a list of so-called essential medicines. Back in 1977, the World Health Organization (WHO) created this concept, and today each of at least 130 countries has its own list. Compiling a master file from these was a Herculean task, since the lists have different medicines considered essential (tropical medicines, for example, appear only on some). The lists are also in different languages, and drugs often go by different names.

The team has now created a master file of 2,200 medicines, most of them available in Canada. These include common prescription drugs for high blood pressure, asthma, bacterial infections, skin conditions, depression, anxiety, HIV/AIDS, heart disease, diabetes and many other conditions. The researchers are now systematically searching the literature on each drug and analyzing the studies that led to their being approved. The goal: to verify that there is substantial ›

PHOTO: VICKY LAM

evidence supporting the efficacy of each drug. "When you even just scratch the surface, you realize there are commonly used medications that are not backed by enough evidence," says Persaud.

He wants to make clear he's not anti-medication; he's pro *effective* medicines. "The point of the essential medicines movement is to weed out ineffective medicines in order to promote access to the most effective treatments." Drugs that don't work come with risks and costs: they prevent patients from receiving appropriate treatment, they may have unwanted side-effects and they waste a country's limited resources.

So how did ineffective medicines get on the market in the first place? Many, including Diclectin, received approval decades ago – before regulators such as Health Canada required clinical trials. Some of these medicines might not be approved today. In other cases, several drugs might act in similar ways, so some could be redundant. As it stands now, there are about 13,000 pharmaceutical products approved for sale in Canada – an unwieldy number for doctors, pharmacists and patients to navigate. Persaud says a carefully curated short list, containing a few hundred essential medicines that have been proven effective, would lead to less confusion and help ensure patients receive the right ones. It could also allow governments in Canada to collectively purchase a smaller number of medications in larger quantities, resulting in cost savings.

Persaud's interest in essential medicines was sparked in 2010, when a pregnant patient questioned him about Diclectin's effectiveness. When he couldn't find any literature supporting it, he made what he thought was a routine request to Health Canada for data. Health Canada said it couldn't release what it called confidential business information. That led to Persaud's seven-year hunt, filled with freedom of information requests, before finally receiving data indicating that the medicine did not meet the drug company's own standards for effectiveness. Health Canada maintains that the drug is safe and effective, but has announced a plan to make information about the safety and efficacy of drugs more publicly available in future.

Results from Persaud's essential medicines project are expected in two years. – **MARCIA KAYE**

## One of Canada's Mightiest Computers Tackles a Very Complex Question

A U of T professor is using serious processing power to understand what role the world's oceans play in climate change

**CANADA'S MOST POWERFUL** research supercomputer, unveiled earlier this year at U of T, will enable researchers to focus immense processing capability – equivalent to some 60,000 desktop machines – on a single, complex question. And its first use could lead to a better understanding of how the world's oceans affect climate change.

The $18-million system – dubbed "Niagara" – is the first major upgrade at SciNet, U of T's high-performance computing division, in a decade. With 10 times the power of its predecessor, Niagara is supported by 12 petabytes (12 million gigabytes) of storage. It's believed to rank among the top 50 supercomputers in the world.

The system is housed in a secure, nondescript location in Vaughan, Ontario, and requires less power than its predecessor, with savings roughly equivalent to the energy used by 300 homes in a year.

For Niagara's first test, Richard Peltier, a U of T University Professor of physics, and colleagues from the U.S. and Canada, ran a calculation related to a research question about the behaviour of oceans. It generated millions of gigabytes of data. The researchers then used the supercomputer to compare the data with observations streamed from two sensors located on the floor of the Pacific Ocean.

The results of this research will improve our understanding of ocean internal waves, which occur far below the water's surface. Peltier hopes a deeper knowledge of these waves will improve our ability to explain the evolution of ocean temperature, salinity, circulation and marine biology – and to create better models of climate change.

Peltier, who is also the scientific director of SciNet, came up with the idea of running a "heroic calculation" on Niagara after discussing with colleagues how best to strenuously test the power of the new system.

"Devoting the entire machine, not only a portion of it, to this one calculation is what makes the calculation 'heroic,'" he says. "This is pure, curiosity-driven research." – **JENNIFER ROBINSON**



PHOTO: ISTOCK

THE BIG IDEA

# Predicting Where Infectious Diseases Will Strike Next

## Climate change adds a new wrinkle in the quest to get out in front of epidemics

**SPRING ARRIVES EACH YEAR** in Ontario with fresh concerns over diseases such as West Nile and Lyme, which flare up during warmer weather. If we could predict where and when an outbreak might occur, it would almost certainly make it easier to manage or prevent it. This is the Holy Grail of epidemiology, a cornerstone of public health that traces its roots to the Greek physician Hippocrates and now concerns people such as Isaac Bogoch, a U of T professor in the Faculty of Medicine and a tropical disease specialist at Toronto General Hospital.

A big challenge for epidemiologists is to identify the conditions under which a disease might spread. For certain viral diseases transmitted by tropical mosquitoes, Bogoch and his research group have developed a novel approach that combines the effects of climate change with data on airline travel and the distribution of mosquitoes that carry the disease. Using this model, his team has correctly predicted the extent of two recent, high-profile outbreaks.

In 2014, they identified the likely origin and potential spread in the Caribbean of Chikungunya, a mild African viral disease carried by mosquitoes. Using arrival and departure information from Caribbean airports, the model correctly predicted how the subsequent epidemic would affect 25 Caribbean islands, northern South America and Florida – all adopted homes of the mosquitoes that transmit the virus. Within six months, more than 16,000 confirmed and 900,000 suspected cases were logged, many of which might have been prevented if regional public health officials had been provided with the resources to act on the scientists' predictions.

As the Chikungunya epidemic waned in the spring of 2015, Bogoch and his group began modelling the potential outbreak of another African virus spread by mosquitoes: Zika. Their study, published early the following year, showed the virus's likely transmission patterns. Again, the study predicted the epidemic accurately: Zika raged through 50 countries in the Americas, infecting millions and prompting the World Health Organization to declare a global emergency.

As the international health community responded to the outbreak, Bogoch's group developed a model for African and Asia-Pacific countries susceptible to Zika's spread. They identified regions and times where the health, economic and social effects from Zika would be greatest so that public health authorities in resource-limited areas could be ready to respond should the disease appear.

The utility of such modelling is clear – as is the takeaway. "The reasons for these large-scale outbreaks are increased globalization, greater individual mobility and changing weather patterns – none of which are going away," says Bogoch. "Increasingly, it isn't about a *new* virus outbreak, but trying to figure out how those we already know about will expand into new territories." – **LESLIE ANTHONY**

LINGO

## Dark data

A growing number of gadgets track how far we walk in a day and how many hours we sleep at night. But these numbers don't tell us anything valuable about our overall health, says Jayson Parker, a biology professor at U of T Mississauga. "For the average person without a medical condition, this knowledge is useless," he says. The information these devices provide is what medical researchers call "dark data." It's gathered but then not useful for decision-making.

Parker notes, however, that insurance companies have grown interested in research showing that less sedentary people have better heart health – in which case "steps per day" may turn out not to be "dark" after all. In his own research, Parker is using biometric information to predict superior health outcomes over a 36-hour period. Success would bring this data "into the light," too.

ILLUSTRATION: SÉBASTIEN THIBAULT

The Lem family has strong connections to U of T. John and Paul's father, Ken, and sister, Melissa, also graduated from the university

STARTUP

# Could This Palm-Sized Cube Replace an Entire Lab?

## Spartan Bioscience, founded by three alumni, aims to make DNA testing more accessible

**IN A WORLD OF** instant outcomes, some things still take time. If you need a DNA test, you or your physician must send a sample to the lab and then wait for the results – sometimes several days or even weeks. Specimens are occasionally lost or mislabelled.

This kind of delay or mishap may soon be a thing of the past, though, thanks to a device developed by Spartan Bioscience, an Ottawa company founded by brothers John Lem (BASc 2005) and Paul Lem (BSc 1998) and Dr. Jamie Spiegelman (BSc 1999, MD 2005). They have commercialized a cube-shaped DNA-testing device about the size of a mug that has received approval from the U.S. Food and Drug Administration and from Health Canada. It can be operated with minimal training and fits almost anywhere, allowing pharmacies, doctor's offices and other health-care organizations to conduct DNA testing cheaper and faster. Users simply do a cheek swab and insert it into the device, which generates results in less than an hour.

John Lem, the company's vice-president of corporate development, says Spartan is marketing a handful of tests for the device, including one that screens for a genetic mutation associated with Alzheimer's and another that can be used to test for the presence of legionella bacteria in the air-cooling systems of large commercial buildings. (Bacteria that get into these systems can trigger outbreaks of Legionnaires' disease, a severe form of pneumonia.) To date, he notes, there's been no good way to test quickly for legionella in these systems. The cube allows tests to be conducted on a regular basis so property managers can ensure consistently safe buildings.

The most ambitious application, however, involves using the device to identify individuals who may not know they are resistant to certain life-saving drugs. Clopidogrel (also known as Plavix), for example, is the mostly commonly prescribed blood thinner for people who have had a stroke or heart attack. But about 30 to 40 per cent of the population has a genetic mutation that renders clopidogrel ineffective for preventing clots.

The cube allows emergency physicians to test patients quickly and then prescribe one of two alternatives to clopidogrel if warranted. Researchers in the U.S., Canada and South Korea, working in collaboration with the Mayo Clinic, are testing the cubes on 5,000 patients to investigate how they improve outcomes for patients who have suffered a stroke or cardiac arrest. Such applications, John says, represent a step toward personalized medicine, but also hold out potential for bringing more precise, inexpensive and timely care to people living in low-income regions of the world with little access to lab testing.

For now, Spartan sells the cubes for between $5,000 and $10,000, but hopes to eventually sell testing cartridges instead of the device itself. "Our goal," John says, "is to give them away for free." – **JOHN LORINC**

## Findings

### Sibling Influence

It's well known that parents can positively affect their children's development. But a study from U of T and the University of Calgary shows that siblings can also have a dramatic impact on each other's development. Support from an older sibling can boost a child's language skills and understanding of another's point of view.

Siblings also play a role in the development of empathy. The study, by OISE professor Jennifer Jenkins, Marc Jambon, a U of T postdoctoral fellow in psychology, and Sheri Madigan, of the University of Calgary, found that children who are kind, supportive and understanding influence their siblings to behave in similar ways. Importantly, the researchers were able to remove the influence of parents so they could attribute growth in a child's empathy skills directly to their sibling.

**– THE CONVERSATION CANADA**

### Illness in Ontario

The proportion of Ontarians who died with two or more chronic conditions increased from 80 per cent in 1994 to 95 per cent in 2013, according to a new study from U of T's Dalla Lana School of Public Health and the Institute for Clinical Evaluative Sciences.

The researchers examined more than 1.6 million deaths in Ontario, and linked each to data from Ontario's health-care system. "We identified 18 chronic conditions that individuals accumulated up to the time of their death and examined how these trends differed over time and by socioeconomic status," says Laura Rosella, a U of T epidemiology professor.

Rosella and her team found that individuals who lived in low-income neighbourhoods were more likely to die with COPD, mental health disorders and diabetes, while cancer and dementia at time of death were more common among people who lived in high-income neighbourhoods.

**– DEBORAH CREATURA**



PHOTO: COURTESY OF SPARTAN BIOSCIENCE

Among the games students play in the course "Video Games and Narrative" are *Thirty Flights of Loving*, a first-person adventure by Blendo Games, and *Papers, Please*, a moral puzzle by Lucas Pope

# Q&A

## Ready Student One

### English class gets an update with a new kind of "text"

Pac-Man may be just a mouth, but he's got an insatiable hunger and that alone means he has a story to tell, says U of T Mississauga English professor **Lawrence Switzky**. He spoke recently with *U of T Magazine* about a new course he's teaching on video games and why he sees a place for Zelda and Mario in the canon next to Austen and Wilde.

**My Grade 11 English teacher was a traditionalist who taught Shakespeare and grammar. He would have been appalled at the idea of video games infiltrating English class. What's your rationale for including them?** Video games are in a similar position to us as cinema was to people in the early 20th century: they're a new art form. People are sometimes suspicious of video games for this reason, but it makes sense to study them now as we would film or fiction.

**As with movies and books, I'm sure there are some video games that are more interesting to talk about than others. How do you choose?** The most interesting games ask players to make an emotional investment. Sometimes that involves having a complicated relationship with a game character. Sometimes it means confronting a complex subject. The first game we play is *Every Day the Same Dream*. The game simulates going to work and experiencing little variety or satisfaction in your job. Then it presents you with small alternatives. The game asks you if these variations to your everyday routine are enough, or if you want more. You have to decide if you want to change the whole system – or if you can find satisfaction in the existing structure.

**Are your students learning the same skills they'd learn in a typical literature class, or different ones?** I hope a mix of both. We talk about how games engage in characterization, and how our encounters with game characters differ from how we experience literary characters. We often talk about the mechanics of a game – the rules that govern a game and the constraints on you as a player. We talk about how different mechanics generate different story possibilities.

What I hope comes out of this is that by undertaking the comparison in a sustained and rigorous way, you come to know something about literature as well as something about games that you wouldn't have known before.

**Video games are often criticized for violence. Does the class explore this?** We discuss a report by the American Psychological Association about the influence of video game violence on children. We also talk about why a player's role so often takes on violence. I show slides and talk about examples of games that have been censored or banned for their violence.

We also talk about gender and race in games. We talk about ethical gaming. Many games now ask players to make ethical decisions, such as to steal or not steal. Who gets to live and who dies. There are games about the Syrian refugee crisis. Games enable students to explore how to live in a complex and often unsteady moral universe. We have some very difficult and honest discussions about whether we think games can produce any kind of social change.

**What place do video games hold in the lives of your students?** My students are enormously passionate and thoughtful about their gaming experiences. A lot of them talk about being moved by a moment when they were wrong about something in a game – such as thinking that a certain character was their friend, and then realizing the character was not their friend, or thinking that an action they performed was beneficial, and then finding out that it was actually injurious.

**And the place of literature?** Many of my students are interested in literature but don't know a lot about it yet. With video games, the students, if anything, know *too much* about them. But this allows me to say, "Let's look at these works you're so invested in, and think about them critically." They always have opinions, and come to class ready to debate.

PHOTO : ISTOCK

Students in U of T's Book and Media Studies program are designing a board game based on the ideas of Marshall McLuhan, to be unveiled at Toronto's Digifest in late April

## All In on Gutenberg

At times, Prof. Paolo Granata encourages his students to play poker (and other card games) – in class. There's no money at stake, but he does hope they'll learn a few things.

Granata, a professor in the Book and Media Studies program, has designed a deck of playing cards to help students remember unique terms from print culture and the history of books. Inspired by both traditional flash cards and a deck of aphorisms created by media theorist Marshall McLuhan, the cards feature a picture of Johannes Gutenberg, the inventor of mechanical movable type, on one side and a definition on the reverse.

"Marginalia" appears on the 10 of diamonds, for example, and "codex" on the queen of spades. Gutenberg himself is the joker. Granata gets students to correctly explain the words on the cards as they are played. This kind of experiential learning is a great way to help students grasp and retain knowledge, he says; the unusual experience of playing cards in class sticks in the memory. "I strongly believe in the power of playfulness to inspire creativity and imagination," he says.

**– BRENT LEDGER**

## Greener Pastures

### Can a simple high-tech tool for farmers boost crop yields in developing countries?

**AHMED MAHMOUD** (BASc 2011, MASc 2016) hopes that his new invention – an unassuming grey box about the size of a coffee mug, attached to a metal probe – will be the key to significant improvements in crop yields for farmers in Nepal and around the world.

"You stick the probe in the soil and it reads the moisture," he says. "Then it makes that data available online or via text messages. You can query it on your phone."

In March, Mahmoud's collaborator Donn Pasiliao (BASc 2011, MASc 2014, MA 2017) travelled to Nepal to provide 30 of the portable, networked probes for a test run. The goal is to see whether this low-cost method of gathering detailed, hyperlocal information about soil moisture can be used to help improve crop yields.

Mahmoud and Pasiliao, founders of Spero Analytics, were inspired to create the device after hearing about the Data Driven Farming Prize, an international competition. While there are a number of development agencies working with farmers in Nepal to improve their agricultural productivity, Mahmoud says they are limited by a lack of real-time analytics. "They have made detailed maps of average rainfall, soil acidity and nutrient levels," he says. "What they don't have is data on soil moisture levels, temperature and other conditions that change rapidly."

In Canada, farmers can get this information from on-site weather stations or instruments such as tensiometers, which measure soil moisture. Mahmoud's vision is to take off-the-shelf probes and add the ability to wirelessly share data within a network. Mahmoud built the first prototype for less than $100.

In September, the pair was awarded one of two $50,000 runner-up prizes. That prize money funded the construction of the 30-device network that is now heading to Nepal. The results of this first trial will inform further design of the devices. Eventually, Mahmoud hopes to add sensors for temperature and humidity as well as moisture.

**– TYLER IRVING**



PHOTO: PAUL WEEKS

# KATRINA DREAMS OF HELPING KIDS GET A GOOD START IN LIFE.

**She knows that means much more than taking classes.** Halfway through her master's of social work, Katrina won the Gene Dufty Odell Memorial Bursary. Established by Mrs. Odell, a former social worker, the award has greatly eased Katrina's financial pressures. The bursary helps Katrina fund her education and pursue enhanced learning opportunities. "All this will give me more skills to help kids and families down the road," she says. Make a legacy gift to U of T today to help students like Katrina become the best social workers they can be.

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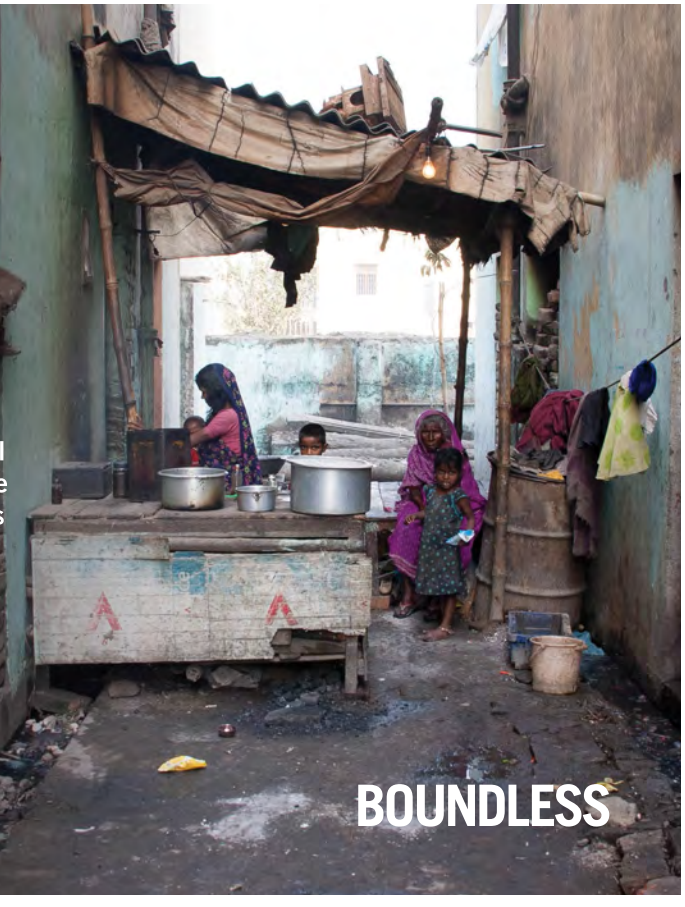
# WHAT'S THE GREATEST BARRIER TO HELPING THE POOREST OF THE POOR?

# REACHING THEM.



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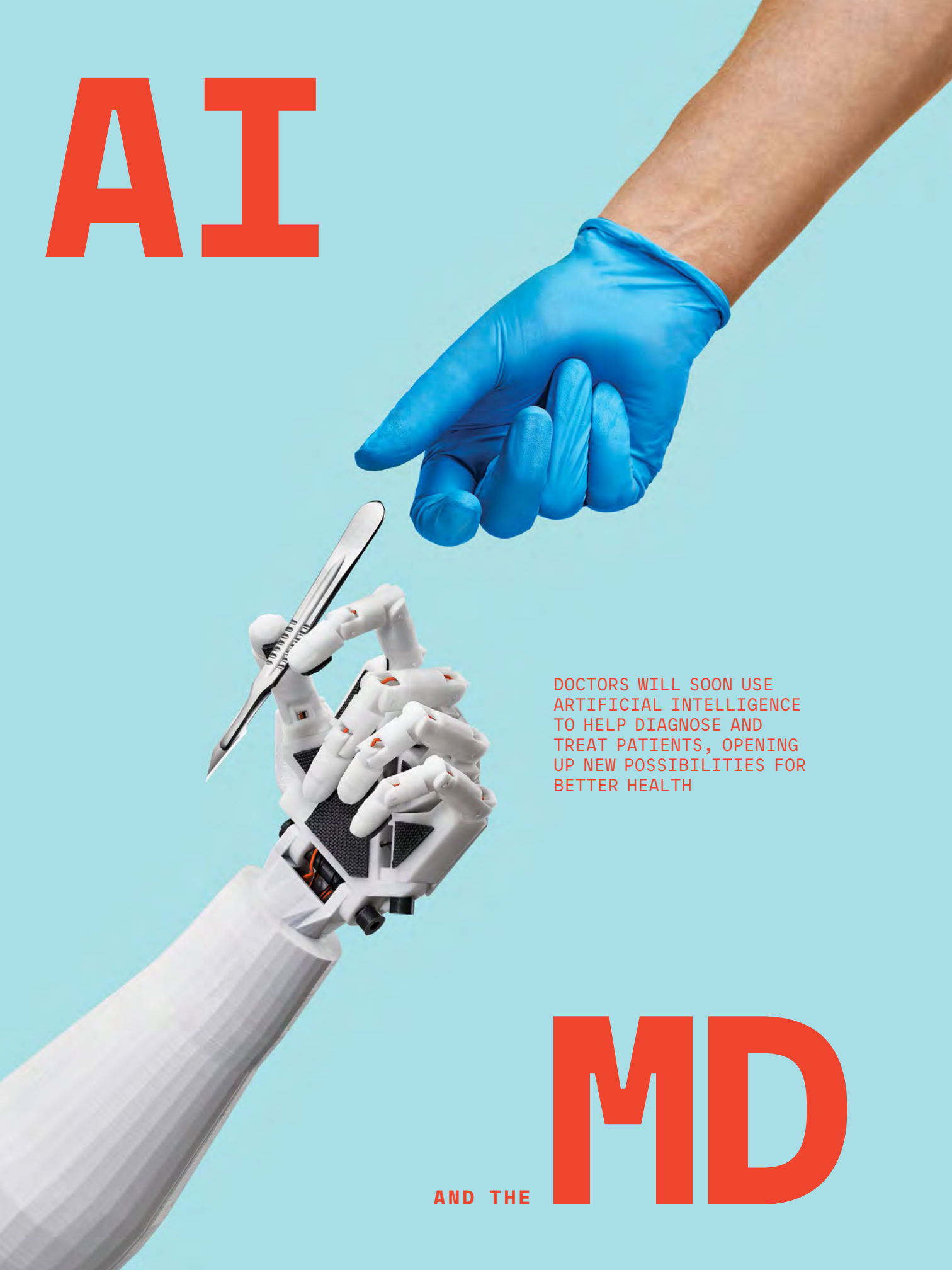
BOUNDLESS

# AI



DOCTORS WILL SOON USE ARTIFICIAL INTELLIGENCE TO HELP DIAGNOSE AND TREAT PATIENTS, OPENING UP NEW POSSIBILITIES FOR BETTER HEALTH

# AND THE MD

BY PATCHEN BARSS

**IF YOU'VE NEVER HEARD OF GENE TP53**, consider yourself lucky. It's a "tumour suppressor gene." It generates a protein that keeps your cells from growing and dividing too quickly.

Many people only get to know this gene if they have a rare mutation that stops it from working properly – a condition called "Li-Fraumeni Syndrome." People with the syndrome will almost certainly develop cancer. If they survive one type of cancer, they'll likely get another. And another. And another.

"It's not a question of if. It's a question of when," says Anna Goldenberg, a professor of computer science at U of T and a senior scientist at the Hospital for Sick Children. In one of her research projects, she's using machine-learning algorithms to try to answer "the question of when" for families who have a child with Li-Fraumeni Syndrome.

Some children will get cancer in their very early years. Others can be tumour-free for decades. If Goldenberg's algorithms can predict near-term risks, it could save some families years of blood tests, CT scans and other invasive monitoring that young children often can't understand.

"It's very hard to get a kid to lie still for a scan when they are two or three. It's impossible to explain to them why they need this to live," Goldenberg says. "It becomes very burdensome on their families."

Goldenberg, who is also a member of the health subgroup at Toronto's Vector Institute for Artificial Intelligence, is working on an algorithm that could use markers in a single blood sample to predict whether a baby with Li-Fraumeni Syndrome will develop cancer before the age of six. Those not at immediate risk can be spared a highly medicalized life for their first few years.

Her project, being conducted at Sick Kids, could help doctors and patients reduce their reliance on guesswork, subjective opinions and one-size-fits-all medical solutions. Machine-learning algorithms could help with almost every type of health problem, from cancer to diabetes to depression – and improve risk assessment, diagnosis, prevention, management and treatment.

Machine learning, a branch of artificial intelligence research, involves training computers (or having them train themselves) on large data sets. The computers learn to identify patterns and make predictions about the world based on this training. Machine learning has shaken up fields ranging from finance to voice recognition to airport security.

For health-related machine-learning applications, Ontario presents an especially promising training ground. In addition to being home to a deep pool of AI talent, the province has invested in developing electronic medical records. Because of Canada's universal health-care system, these records could provide (if patient privacy can be protected) valuable source data, covering rich and poor people, urban and rural residents, men and women, not to mention a wide range of ethnicities.

Hidden in that vast, complex mass of data are answers to many questions that once seemed impenetrable. The human mind might not be able to winnow out the kinds of solutions Goldenberg seeks, but machines offer hope.

Traditional medical studies almost always require simplification, removing as many variables as possible to allow researchers to draw conclusions from the data. But that means their solutions are often incomplete or don't work for everyone.

For instance, asthma medicines tend to be tested on a tiny portion of the general asthmatic population. For simplicity's sake, most clinical trials only use asthma sufferers who don't have any complications – which eliminates more than 90 per cent of people with asthma. This means a medication approved for general use might be wrong for most asthma sufferers.

"It's not because doctors are evil or malicious," says Marzyeh Ghassemi, who will join the Vector Institute this summer and start at U of T in the fall as a professor in the department of computer science. "It's because randomized controlled trials are expensive to run and it's challenging to get reasonable statistical guarantees about a drug's performance."

People with multiple conditions make research data complicated, but artificial intelligence can help sort out just this kind of difficulty. Complexity becomes an asset rather than a problem for AIs, which use it to increase knowledge about how drugs and other treatments work in different, specific scenarios.

Several Vector researchers are concentrating their attention on chronic conditions. Ghassemi, for example, is working on new apps to improve how people manage diagnosed depression. Even if a person with depression has regular visits with medical professionals, "most of people's lives are not spent in doctors' offices," she says. This means that warning signs, destructive behaviour and downward spirals can go undetected for too long.

But in an age of smartphones, smart watches and other wearable technologies, people can use their devices as background monitors or "passive sensors." The user does not have to actively log or enter data themselves – an app on a wearable device could track both biological information such as heart rate and sleep cycles, and also social behaviours like how often you leave your house or contact your friends and family. It could analyze changes to your speech patterns and the tone of your voice. Changes to any of these things could be warning signs that an individual is descending into depression.

PHOTOGRAPHY BY JUSTIN POULSEN

"HUMAN BRAINS ARE GOOD AT DECISION-MAKING – USING IMPERFECT INFORMATION AND A WEALTH OF EXPERIENCE TO MAKE COMPLEX CHOICES," SAYS MORRIS. "IT'S VERY HARD TO GET AN ARTIFICIAL INTELLIGENCE TO MAKE THOSE KINDS OF INTUITIVE DECISIONS OR JUDGMENT CALLS"

"It makes a lot of sense to look at passive sensing data to try and understand if there are some characteristics of behaviour, both at the population level and also at an individual level, that affect the way you feel and the way you deal with your chronic condition," Ghassemi says.

An AI-driven app could analyze an ongoing stream of data and flag issues that are highly specific to the wearer. The guidance it offers would be adapted to each individual.

"Maybe what's going to indicate a need to modify medication or intervene for you is that you haven't been outside for a long time. And maybe for me, it's that I haven't called my mother in a long time," she says. Such an app could prompt users to take action, such as going for a walk or talking to a friend.

Not only can machine-learning algorithms analyze huge amounts of data, they can find connections across many *kinds* of data sets: biological, genetic, demographic, behavioural, socioeconomic and so on. When applied properly, this can help doctors and medical researchers understand better what's going on with the health of both large populations and individual patients.

While Ghassemi's project focuses on depression (and so far is looking only at a user's location data), the same tools could be adapted for managing other chronic diseases such as diabetes or Chronic Obstructive Pulmonary Disease (COPD).

Currently, many cancers don't fit into the category of chronic conditions. But Quaid Morris, a U of T professor in molecular genetics and a Vector faculty member, hopes to expand that list by using AI to improve our knowledge of tumours. "The goal is to transform more cancer types into chronic diseases," Morris says. "The condition wouldn't go away, but with treatment, it wouldn't shorten your life very much or significantly diminish its quality."

He's using machine-learning algorithms to combine molecular data with clinical information and learn more about how tumours evolve. It's a relatively new research area, which means many of the questions he's trying to answer are basic science. But it's basic science with a clear goal for applying that knowledge.

Why do some people get cancer and others don't? Why would a particular chemotherapy cocktail work for one person and not another? How do we know who's at risk for which cancers? How can we give each individual the most effective treatment for their unique circumstances? The answers to these questions involve a complex mix of factors that are far easier to address with the assistance of machines.

For example, between five and 10 per cent of breast cancers are thought to be caused by specific hereditary genetic mutations. But not everybody with one of these mutations gets breast cancer.

Other genetic variations can dampen (or heighten) the effects of "breast cancer genes." Diet, lifestyle, other health issues, pregnancy, body chemistry and a huge range of other factors might also affect who gets cancer and who doesn't. All of these potential causes interact with each other in a way that is opaque to even the best human minds.

Machine-learning algorithms offer the possibility of winnowing out the information hidden within the messy network of (potentially) thousands of interrelated variables. They can detect patterns, find correlations and identify causes and risk factors that could ultimately explain why, among women with the mutation, one might benefit from pre-emptive mastectomy, while another might never need any treatment at all.

The algorithms might discover a pattern of gene interactions that shields a certain subpopulation from developing cancer. Or find that people who undergo chemotherapy become more prone to certain cancers. "Your model can be very complex in ways that it couldn't be before, because either you would have trouble getting enough data, or the computation would take too long to get insights," Morris says. "Those two things have improved." Algorithmic analysis will offer patients and doctors better information about the optimal course of cancer treatment.

In addition to pursuing their specific research projects, the members of the Vector Institute health subgroup are also interested in the broad impact of their work and the direction of AI-related health research in general. They all agree that in the near future, AI's role will be to augment the capacity of human medical professionals, not to replace them.

"You need humans for the subjective things," says Morris. "Human brains are good at decision-making – using imperfect information and a wealth of experience to make complex choices. It's very hard to get an artificial intelligence to make those kinds of intuitive decisions or judgment calls."

Smart algorithms will continue to expand their presence in hospitals and doctors' offices, as well as on our personal devices. They will change how we approach disease. Doctors, nurses and patients can all expect to have better data and analysis to help them make smarter, better informed medical decisions.

**Patchen Barss** is a Toronto-based journalist and author.

# THERE'S GREAT POTENTIAL FOR AI IN HEALTH CARE, BUT ALSO MANY QUESTIONS

## A U of T research team is examining ethical issues around the use of artificial intelligence in medicine

Prof. Jennifer Gibson, director of U of T's Joint Centre for Bioethics, is leading a new research project, "Ethics and AI for Health," to study questions of privacy, responsibility and safety around artificial intelligence. "So often, technologies outpace our ability to address ethical questions," she says. Some of the important issues Gibson's project will examine:

**Who will benefit from AI?** "If you're building something that can help patients live better lives, it's very difficult to prevent someone from using that tool to maximize profit – potentially at the expense of those patients," says Quaid Morris, a U of T professor in molecular genetics.

A company could develop an AI tool that is very effective at, say, tailoring cancer treatment to individual patients – and then limit its availability to wealthy patients who can pay a lot for it.

Health-care systems vary around the world, which means new AI tools may be applied very differently from place to place. Some jurisdictions might charge for the tool or limit access to certain groups. A public health-care provider might focus machine-learning algorithms on early diagnoses and preventive medicine to lower health-care costs, whereas a corporation might develop customized tools that serve only those who can pay.

**Who will protect patients' privacy?** When working with medical data, Vector Institute researchers follow strict laws and guidelines that protect individuals' privacy.

But as AI moves from research to application, it could become increasingly difficult to keep genetic and clinical data anonymous. People have gotten used to giving up private information to companies such as Facebook, Google, Amazon and Netflix in return for more personalized recommendations. They may well be willing to disclose medical information in return for better care. This information could end up in the hands of insurers, employers or in the public realm without a patient's consent.

**What will happen when the machine is wrong?** No machine will be perfect. There will always be a risk of a wrong diagnosis. And even the best possible data-driven recommendation might still end with a patient not surviving their illness. Who should be held responsible: the medical team, the algorithm designers or the machine itself?

**How will we avoid machine bias?** Algorithms carry as much risk of bias as any human. Search for "CEO" in an image search engine, for example, and your computer will return mainly pictures of white men. Algorithms tend to amplify the built-in sexism and racism of training data.

In the health sphere, algorithmic bias could mean the machine recommends the wrong treatment for groups that have historically been marginalized from health research.

**What will the impact be on doctors and other health-care workers?** Doctors might find themselves freed from repetitive tasks and able to spend more time with patients. Some technicians might find that computers have taken over their work. Other frontline workers – nurses, paramedics – may see their roles change in unexpected ways.

**What will we do about unforeseen consequences?** In the near future, researchers expect machine-learning algorithms to empower doctors and patients to make better decisions. They won't make decisions themselves. But beyond such limited predictions, nobody really knows how far and how fast artificial intelligence will develop or how it will change society. Gibson believes we should be preparing for big changes, not incremental ones.

"We ought to think of this more as a disruptive, revolutionary technology and not find ourselves surprised five years down the road if we are too passive about it," she says. "It's not about raising the alarm just for the sake of raising the alarm. It's about moving forward with intention."

**– Patchen Barss**

ILLUSTRATION BY YAREK WASZUL

BY CYNTHIA MACDONALD  ILLUSTRATION BY WENTING LI

# ALEXA, COMPOSE ME

SO FAR, MACHINES ARE NOT VERY GOOD AT CREATING ORIGINAL ART, SUCH AS POP TUNES AND SHORT STORIES. WILL THEY EVER BE?

**IT WOULDN'T BE WRONG** to call Steve Engels a musician. After all, he spent eight years of his childhood studying piano, then graduated to guitar, dabbling along the way with the clarinet and drums. "I sampled a lot from the buffet," he says.

But Engels' music teachers could hardly have foreseen where all his training would lead. Today, the U of T computer science professor is not so much a musician as a musical facilitator: someone who gets machines to compose and play music in ways that he, a mere mortal, cannot.

Some might say he's entered uncharted territory. While it's generally accepted that artificial intelligence excels in many respects – it can translate text into any language and beat us at games such as chess and *Jeopardy* – it can't possibly summon the imagination necessary to create art. Or can it?

Engels thinks it can. "Artificial intelligence has the same capacity for creativity that humans have," he says. To teach a computer to play music, he feeds it multiple samples of musical composition, which the computer studies for patterns. It can then generate new music in the same style. While the resulting tune may not be completely original, Engels argues that humans, who have also been known to produce a derivative work or two, follow a similar process – whether we're conscious of it or not. "When it comes to creativity, are any of us completely removed from other inspirations?"

Engels got his start in computer-generated music several years ago by creating rudimentary software (based on a simple machine-learning technique) that could scramble and spew out a series of new patterns inspired by a single piece of music. The initial composition, he admits, was ugly. With more work on the program, the music got slightly better: "It sounded like a distracted jazz pianist."

Since then, he's been able to integrate more than one musical source into his program and incorporate increasingly complex chord progressions. The three base elements he works with are the timing, pitch and duration of chords or notes. What the program does is recombine the chords or notes in novel ways. Under the guidance of one of his students, a computer in the department recently composed four straight hours of "new" Bach music, using the great composer's preferred musical structures.

Bach is known as a highly mathematical composer, which was why he was chosen for this project – more rational, one might say, than delicate Mozart or passionate Beethoven. I ask Engels if he thinks computer compositions lack emotion. "Ah," he smiles, as if I've just stumbled on his missing house keys. "We haven't programmed that layer in yet." A machine, he explains, can only work off the quantity and quality of data it's fed. And so far nobody has figured out a way to program feelings into machines, though Engels thinks in time it will be possible.

Then he asks me to consider something else: when it comes to art, it's really human response – not machine intention – that matters anyway. "What makes one person smile won't have that effect on another. Human artists have this problem all the time, right? So that's where it becomes very difficult to say we're going to make people cry, or laugh."

"I CAN'T IMAGINE A WORLD IN WHICH WE TURN TO ARTIFICIALLY GENERATED STORIES," SAYS ADAM HAMMOND, A U OF T PROFESSOR OF ENGLISH LITERATURE. "STORIES DON'T MEAN ANYTHING TO COMPUTERS, SO WHY WOULD STORIES WRITTEN BY COMPUTERS MEAN ANYTHING TO US?"

As a form of artistic expression, music has a limited but exceptionally powerful vocabulary. Whether put together by human or computer, a handful of notes can, on their own, evoke an emotional response in the listener. That's much harder to do with words.

Accordingly, when Los Angeles–based singer and Internet personality Taryn Southern recorded *IAMAI*, she structured the album (set to be released in May) as a collaborative effort. She wrote the heartfelt human lyrics, while programs with names such as Watson Beat and Amper Music came up with tunes that matched her moods. It's said to be the first pop album composed and produced by artificial intelligence.

Southern's music doesn't sound in any way inhuman. In its predictable chord changes and superficial melancholy, it actually resembles most current pop music. It puts one in mind of a scene that Engels likes to evoke from the Isaac Asimov–inspired movie *I, Robot*. When Will Smith's character asks a robot if it can write a symphony, the robot responds: "Can you?" The implicit answer is, well, sure – with enough time and training. But most of us won't produce anything that's very good.

Recently, U of T computer science professors Sanja Fidler and Raquel Urtasun, and PhD student Hang Chu, created computer-generated musical compositions with lyrics. Chu and the team trained a neural network on images and their captions, song lyrics and 100 hours of online music to create a program that could analyze a digital photograph and then write a song about it. One piece I heard, based on a Yuletide photo, is musically creepy – and lyrically *very* off. "I've always been there for the rest of our lives," sings the machine. "A hundred and a half hour ago." (One Internet commentator noted, though: "It's still better than Paul McCartney's 'Wonderful Christmastime.'")

Where words are concerned, it may be that AI is just in its "distracted jazz pianist" phase and things will get better. But Adam Hammond, a U of T professor of English literature, doesn't think so. "I can't imagine a world in which we turn to artificially generated stories," he says. "Stories don't mean anything to computers, so why would stories written by computers mean anything to us?"

Though an expert in the century-old works of British Modernist authors, Hammond champions the use of digital tools to analyze literature. Working with Julian Brooke, a professor at the University of British Columbia who specializes in computational linguistics, he's developed algorithms that can plumb the depths of existing texts – discovering stylistic properties that humans might not notice but that tell us much about the way humans write.

Last year, he and Brooke used an algorithm to analyze common thematic elements in 50 science fiction stories given to them by author Stephen Marche (MA 1998, PhD 2005). (The stories were written by masters of the form, such as Ursula LeGuin and Isaac Asimov.) The computer then supplied Marche with 14 theme-related rules he could use to write the "ultimate" science fiction story. These included a directive to use "extended descriptions of intense physical sensations and name the bodily organs that perceive these sensations." Marche also received separate style guidelines, such as to use a lot of adverbs.

The process wasn't AI per se, in the sense that Marche (not the algorithm) did the actual writing. But "it showed how humans can collaborate with algorithms to create new kinds of art," Hammond says.

Hammond does think a computer could write a story on its own – just not a very good one. "Every night we humans go to sleep and make up stories in dreams," he says. "There's some kind of biological imperative to make sense of our lives through storytelling. Computers don't have that." Indeed, AI makes us realize that as consumers of art we may be connecting subconsciously with the artist's need to make it.

But Hammond still thinks AI can spur creativity, or help writers think up themes. Computers are already fairly good copy editors; his experiment shows they can act as substantive editors as well, by supplying rules and detecting irritants such as prejudice or excessive repetition on the writer's part.

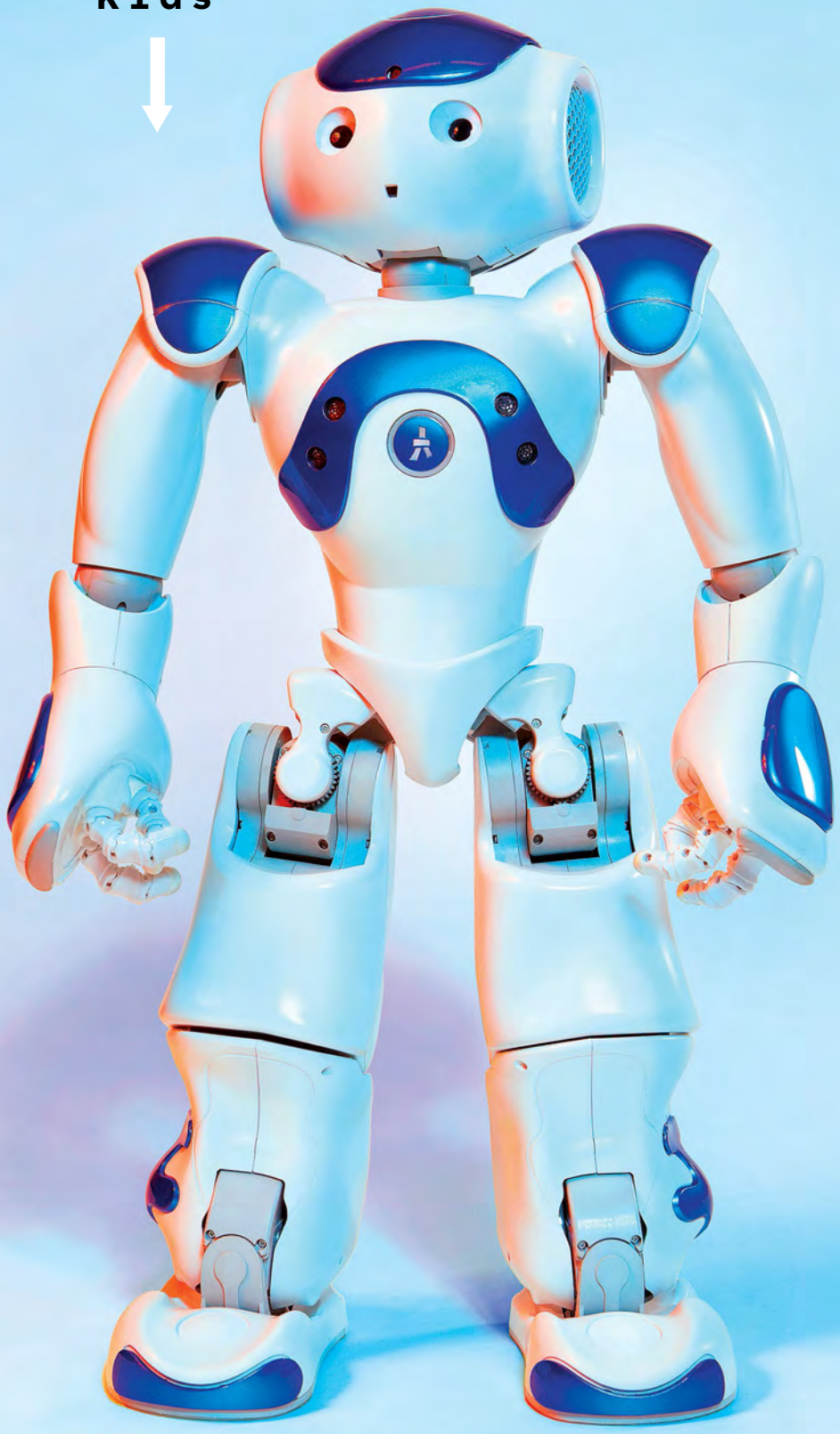
Neither Hammond nor Engels believe that AI will affect artists' jobs in the way that it has already eliminated others. Engels says his software was designed to "help people who wished to hire composers, but couldn't. We never wanted to take anything away; we wanted to give something to people who couldn't have it otherwise."

Still, he looks at programs such as Google's DeepDream (which creates original artworks by training off of existing paintings) and wonders at the possibilities. "There are a lot of people who can't hire artists who now go to Google Images and pull down things from the Creative Commons," says Engels. "Wouldn't it be great if you needed an original piece of art, and you didn't want to download what everybody else was downloading? You could provide the software with a sample of what you're looking for, and get an unending stream of music in that style."

Downloading art, as opposed to writing, painting or singing it, may seem depressingly mechanistic to some. But the only real question is: Does your human mind appreciate it? If so, there isn't much arguing with that.

**Cynthia Macdonald** (BA 1986 St. Michael's) is a Toronto journalist.

# A R0b0t That Cheers Up Kids



This two-foot-tall robot, which can talk, sing, dance and do tai-chi, may look like a toy, but it harnesses advanced technology to serve a serious purpose.

For several months in 2016, Jennifer Stinson, a U of T nursing professor and a scientist at the Hospital for Sick Children, used the robot to test ways to reduce feelings of fear and anxiety in child cancer patients aged four to nine.

As part of their treatment, the children have to undergo a procedure that involves getting a needle. With one group of kids in the study, MEDi (the robot) sang and danced. With another group, he was programmed to narrate what was happening and provide encouragement.

"Time now for a little clean," he says in a friendly and childlike voice, explaining the antiseptic wipe. Post-needle, he praises the child: "Do you have a superpower that makes you so brave?"

Kathryn Birnie, a psychologist on the research team, says MEDi helped both groups of kids feel less anxious, which made life easier for the nurses administering the needle – and pleased parents. MEDi is now back in the shop for some programming, but Birnie expects he'll return to bedsides soon.

**– Scott Anderson**

PHOTOGRAPHY BY PAUL WEEKS

welcome

PHOTOGRAPHY BY VICKY LAM

# Artificial Intelligence Is Here. Is It Time to Rethink Your Business Strategy?

TO ANSWER THIS QUESTION, CONSIDER THIS THOUGHT EXPERIMENT

**MOST PEOPLE ARE FAMILIAR** with shopping at Amazon. As with most online retailers, you visit its website, shop for items, place them in your cart, pay for them – and then Amazon ships them to you. Right now, Amazon's business model is "shopping then shipping."

During the shopping process, Amazon's artificial intelligence offers suggestions of items that it predicts you will want to buy. The AI does a reasonable job. However, it is far from perfect. In our case, we found informally that the AI accurately predicts what we want to buy about five per cent of the time. We actually purchase about one of every 20 items it recommends. Considering the millions of items on offer, that's not bad!

Imagine that the Amazon AI collects more information about us and uses that data to improve its predictions, an improvement akin to turning up the volume knob on a speaker dial. But rather than volume, it's turning up the AI's prediction accuracy.

At some point, as it turns the knob, the AI's prediction accuracy crosses a threshold, changing Amazon's business model. The prediction becomes sufficiently accurate that it becomes more profitable for Amazon to ship you the goods that it predicts you will want rather than wait for you to order them.

With that, you won't need to go to other retailers, and the fact that the item has arrived at your home may well nudge you to buy more. Amazon gains a higher share of wallet. Clearly, this is great for Amazon, but it is also great for you. Amazon ships before you shop, which, if all goes well, saves you the task of shopping entirely. Cranking up the prediction dial changes Amazon's business model from "shopping then shipping" to "shipping then shopping."

Of course, shoppers would not want to deal with the hassle of returning all the items they don't want. So, Amazon would have to invest in infrastructure for the product returns – perhaps a fleet of delivery-style trucks that do pick-ups once a week, conveniently collecting items that customers don't want.

If this is a better business model, then why hasn't Amazon implemented it already? Because if it did so today, the cost of collecting and handling returned items would outweigh the increase in revenue from a greater share of wallet. Using our example, we would return 95 per cent of the items it ships to us. That is annoying for us and costly for Amazon.

The prediction isn't good enough for Amazon to adopt the new model. But we can imagine a scenario where Amazon adopts the new strategy even *before* the prediction accuracy is good enough to make it profitable because the company *anticipates* that at some point it will be profitable. By launching sooner, Amazon's AI acquires more data and improves its predictions faster. Amazon realizes that the sooner it starts, the harder it will be for competitors to catch up. Better predictions will attract more shoppers, more shoppers will generate more data to train the AI, more data will lead to better predictions, and so on, creating a virtuous cycle. Adopting too early could be costly, but adopting too late could be fatal.

Our point is not that Amazon will or should do this, although skeptical readers may be surprised to learn that the company obtained a U.S. patent for "anticipatory shipping" in 2013. Instead, the salient insight is the impact on strategy. In this example, it shifts Amazon's business model from "shopping then shipping" to "shipping then shopping," generates the incentive to operate a service for product returns (including a fleet of trucks) and accelerates the timing of investment.

All this is due simply to turning up the dial on the prediction machine. What does this mean for *your* strategy? First, you must invest in gathering intelligence on how fast and how far the dial on the prediction machines will turn for your sector and the work you do. Second, you must invest in developing a thesis about the strategic options created from turning the dial.

To get started on this "science-fiction" exercise, close your eyes, imagine putting your fingers on the dial of your prediction machine and, in the immortal words of Nigel Tufnel from *Spinal Tap,* turn it to 11.

Excerpted from *Prediction Machines: The Simple Economics of Artificial Intelligence*, by Ajay Agrawal, Joshua Gans and Avi Goldfarb, professors at U of T's Rotman School of Management.

ILLUSTRATIONS BY KAROLIS STRAUTNIEKAS

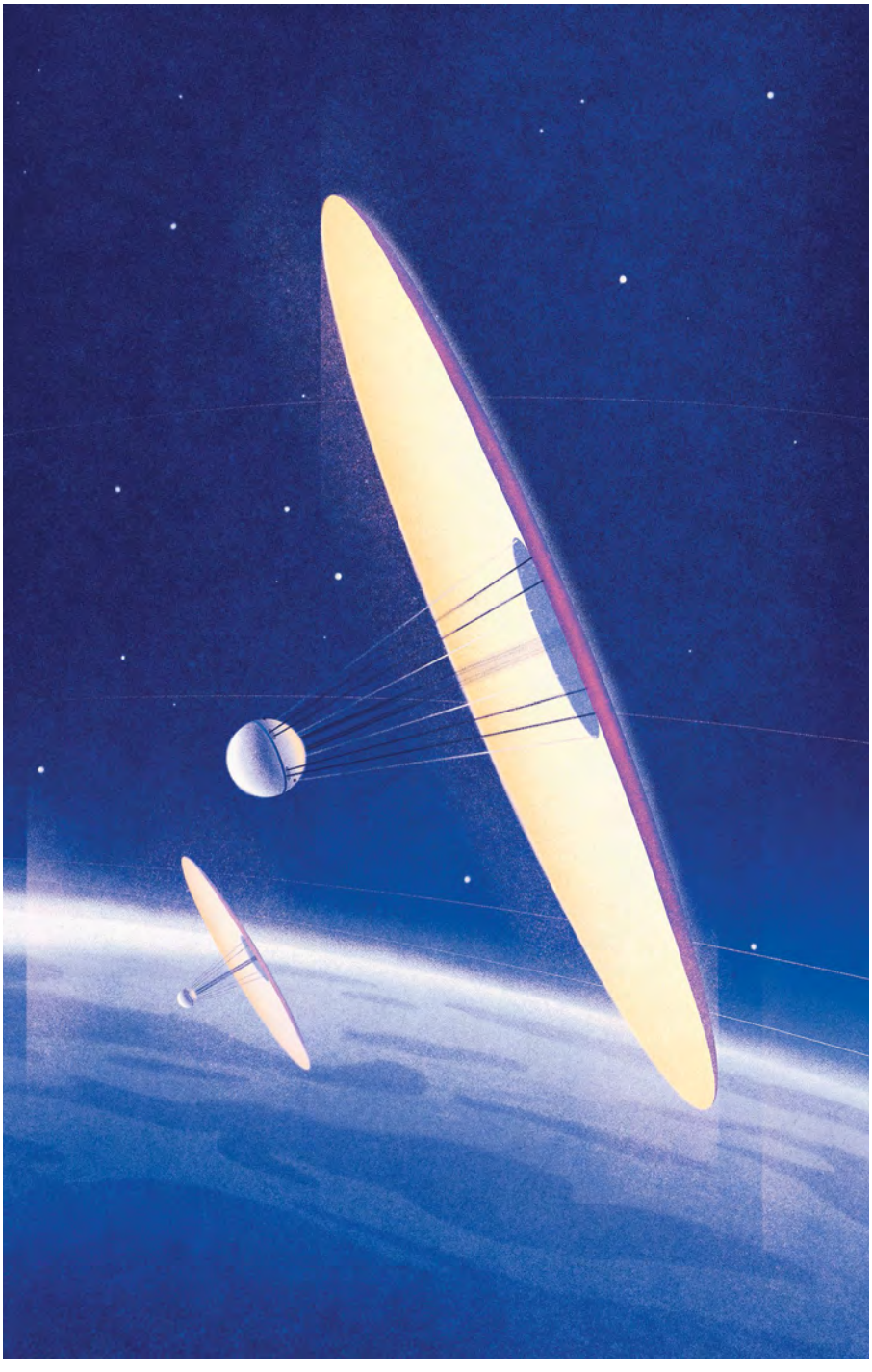
# BRINGING SCI-FI TO LIFE

FROM VIRTUAL WORLDS TO BRAIN-COMPUTER INTERFACES—SEVEN INTRIGUING TECHNOLOGIES THAT U OF T SCIENTISTS ARE WORKING ON RIGHT NOW

NO.1

# A NEW GENERATION OF SPACECRAFT, POWERED BY LIGHT

SOLAR SAILS COULD PROPEL SHIPS TO OTHER PLANETS – AND EVEN STARS – WITH MUCH LESS FUEL



**HUMANS HAVE LONG** dreamed of going to the stars – but exactly how we'd get there has always been an open question. Once you've achieved a high speed, you can just coast along (thank you, Newton's first law of motion) – but to get your speed up in the first place, you need some sort of propulsion system.

Today, we use chemical-burning rockets – but the fuel is heavy, which means launching a fuel-laden craft and accelerating it to an adequate speed requires even more fuel, and so on. The bottom line is that it's costly and ineffective.

But there might be an easier way. What if we could rig up a "solar sail" that could use sunlight (or starlight) to propel a spacecraft, just as the wind propels a sailing ship? Jules Verne speculated about such technology in his 1865 novel, *From the Earth to the Moon*.

We're now just beginning to use solar sails in real life, as scientists recognize the advantages that they offer, in some situations, over traditional chemical-powered rockets.

"The idea is that we're using pressure from light photons as a means of propulsion," says Chris Damaren, director of U of T's Institute for Aerospace Studies. Damaren has been studying the feasibility of solar sail technology – using extremely thin materials that can intercept light from the sun, pushing a spacecraft just as the wind pushes on a ship's sail. The analogy doesn't end there: you can even steer a solar-sail-equipped spacecraft in just the same way that one steers a ship, by carefully adjusting the orientation of the sail.

A solar sail would solve the fuel problem: sunlight is already there, ready to use, though you still need a chemical rocket for the first leg of the journey, from the launch pad to low-Earth orbit. It would be cheaper, too. A solar-sail-powered craft requires just enough fuel to escape the Earth's gravitational tug; after that the ride is "free."

The technology has already been tested: In 2010, Japan's experimental IKAROS spacecraft used a solar sail to fly past Venus and, in 2015, enter its orbit. Later this year, LightSail 2, developed by the non-profit Planetary Society,

will launch into Earth orbit, deploying a solar sail about the size of two parking spaces as a test of controlled solar sailing in orbit. And in 2019, a NASA mission is set to use a solar sail to rendezvous with an asteroid.

For Damaren, there's immediate practical value to solar sail technology in our own corner of the solar system. One potential use involves the sun. Occasionally, a disturbance on the sun's surface sends streams of hot plasma toward Earth. The plasma can interfere with radio transmissions, damage satellites and disrupt power grids. A spacecraft positioned at a certain point between the Earth and the sun would be ideally suited to watch for these plasma streams, sending an alert when needed. "It would be kind of nice to know if one of these was on the way," says Damaren. Such a craft could use a solar sail to "hold its position" at the right spot, by automatically making tiny adjustments to the orientation of its sail.

Another potential use would be for communications in the Arctic. A solar-sail powered satellite could achieve a "pole sitter" orbit, in which the craft moves in a tight rotation above the North Pole, essentially staying "parked" there.

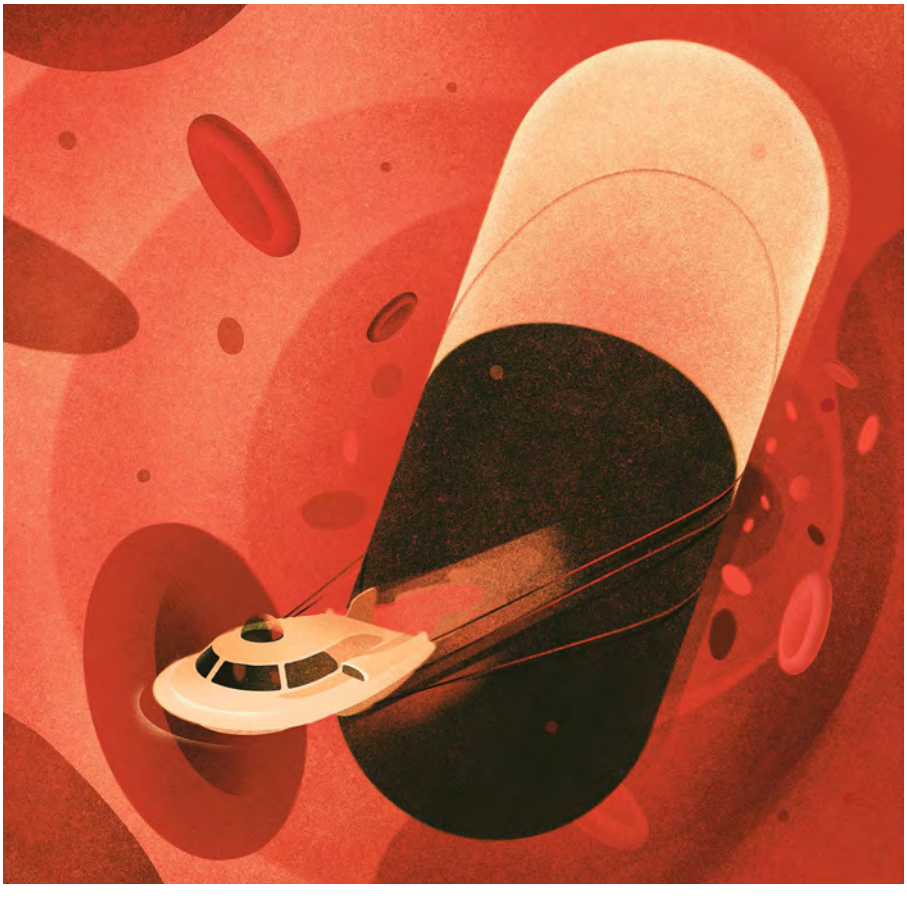
Further down the road, solar sails could be used to propel craft throughout the solar system, and maybe even to other star systems. As long as photons are hitting a solar sail, Damaren explains, it will accelerate – and calculations suggest that speeds of one-tenth the speed of light might be achieved. Powerful ground-based lasers might also be used to give the sails a further boost. A private effort known as Breakthrough Starshot hopes to send a fleet of tiny sail-equipped spacecraft to Alpha Centauri, the nearest star system to Earth, within a generation.

**– DAN FALK**

NO.2

# TINY ROBOTS, AND THE FUTURE OF DRUG DELIVERY

MICROSCOPIC MACHINES MAY SOON SWIM THROUGH OUR BODIES, DELIVERING CANCER DRUGS TO TUMOURS AND ASSISTING WITH DIFFICULT SURGERIES



**IN THE 1966** film *Fantastic Voyage,* scientists shrink a vessel down to the size of a microbe and inject it into the body of a colleague to repair damage to his brain. The shrinking concept remains strictly science fiction, of course, but the idea of using a tiny mechanical device to repair damage to the body is getting closer to science *fact*.

Eric Diller, a U of T professor in the department of mechanical and industrial engineering, and his team build robots a few microns (a thousandth of a millimetre) in size, no larger than a bacteria cell. Their aim is to put these tiny gadgets inside the human body to deliver drugs to their precise target. Getting drugs exactly to where they're needed in the body allows patients to take lower doses – and experience fewer side-effects. This is particularly important for chemotherapy treatment, which aims to destroy cancer cells while leaving healthy ones alone.

The team's microscopic machines don't look like traditional robots, but they are able to carry out basic tasks, such as grasping and releasing nearby objects. Because the devices are so small, there's no room for batteries to power them. Instead, they respond to the action of external magnetic fields to move them through the body. "I think of the robot as the whole system: the device, the external electromagnetic coils, the computer that controls

them and the microscopes that track where they are," says Diller.

The external magnetic fields can also make the robot change shape – for example, opening and closing its claw – by causing magnets in the device to switch between attracting and repelling modes.

Some of Diller's most recent work has focused on building machines that can efficiently swim through human blood. This is challenging because everyday physical forces have very different effects at the micro-scale: to a miniscule robot, the attractive forces between individual water molecules make it feel like a much thicker liquid. "It's like they're swimming through molasses," says Diller. "A tail that flaps from side to side like a fish is not a good strategy at this scale."

Diller and his team have designed a "micro-swimmer," which is only one-tenth of a millimetre thick and about one millimetre long. It looks flat, but contorts itself into undulating waves when subjected to a rotating magnetic field. Its movement is similar to a flounder or other flatfish. "It turns out to be a great way to move objects around at this size," he says. "We can go forward or backward very easily."

It will be some time before the team's devices can undertake more complex operations, but their potential is vast. "The first medical applications of this research are going to be in augmenting the capabilities of minimally invasive surgery," says Diller. "This is particularly appealing for operations that require a lot of dexterity and precision, such as in the brain or the eye. Then we'll build on that to develop tools that can travel through the body under their own power." – **TYLER IRVING**

"THE FIRST MEDICAL APPLICATIONS ARE GOING TO BE IN AUGMENTING MINIMALLY INVASIVE SURGERY. THIS IS PARTICULARLY APPEALING FOR OPERATIONS THAT REQUIRE A LOT OF DEXTERITY AND PRECISION, SUCH AS IN THE BRAIN OR THE EYE"

NO.3

# SCIENTISTS CAN'T READ YOUR MIND. BUT THEY'RE WORKING ON IT

PROF. TOM CHAU'S LAB CAN ALREADY TELL WHAT WORD YOU'RE THINKING OF, OR IF YOU'RE SINGING A SONG TO YOURSELF

**TOM CHAU HELPS THE SILENT SPEAK.** Working with an almost-telepathic technology known as a brain-computer interface, Chau and his lab help people with no speech and limited or no control of their limbs articulate simple words such as "yes" and "no" using only their thoughts. Eventually, people may communicate more complex answers just by thinking them.

For now, the technology requires the subject to wear a cap covered with wires and electrodes (or with light sensors and emitters) hooked up to a computer. When the person speaks a word such as "yes" silently in their head, the computer recognizes certain brain patterns associated with it. One form of the brain-computer interface can even tell if you're singing a song to yourself – and if it evokes a positive or negative emotion.

Chau, a professor at U of T's Institute of Biomaterials and Biomedical Engineering, has been studying brain-computer interfaces for more than a decade and has helped make them more intuitive for users. A key discovery enabled clients to communicate by changing oxygenation levels in their brain.

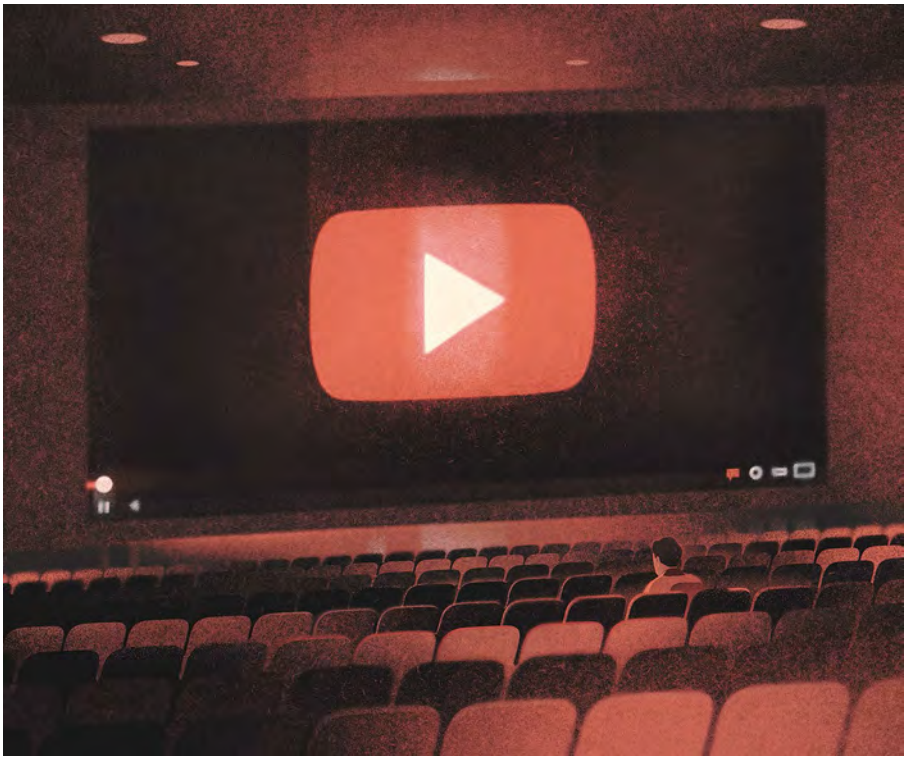
In one experiment, subjects were given a map of the prefrontal cortex region of the brain and taught to change its colour from red to blue and vice versa, where blue signified less oxygen and red indicated more. The map served to guide users in their quest to modify their brain activity and achieve the desired colour. "By the end of the training, these people were able to play a simple video game with their minds," says Chau, who is also vice-president, research, and a senior scientist at Holland Bloorview Kids Rehabilitation Hospital.

Even a brain that's not thinking of a song or a specific word is a very active place. So one of Chau's biggest challenges was to distinguish the signals of a "brain at rest" from one that was trying to send a message. It took several years, but his team was able to create a kind of "profile" of the resting brain. Now they can tell when their subjects are simply tuned out. "That was a big breakthrough," says Chau.

Another challenge is that each person's brain patterns are distinct – my "yes" is not the same as your "yes" – so the machines have to be trained to understand individuals, and this can be a laborious process. Chau is looking at ways to simplify it by having clients listen to a stream of words, all with distinctly different sounds; he then uses the machine to create what is essentially a personal dictionary of the brain's reactions. (Listening to a word activates the same part of the brain as silently saying it.)

Chau's research has focused on applications for children, but the technology could help a variety of people – including individuals with multiple sclerosis or who have suffered a stroke or spinal cord injury.

At the moment, the technology exists only in the lab. But corporations are keen to use brain-computer interfaces in gaming, driving and entertainment, and Chau thinks it's just a matter of time before his version goes mobile. "I think the day when we'll be sending kids home with their own headsets is not that far away. I'd say within the decade, maybe sooner." – **BRENT LEDGER**



NO.4

# SURFING THE NET IS OLD SCHOOL. SOON, WE MAY INHABIT IT

A COMPUTER SCIENCE ALUM HAS CREATED A TECHNOLOGY THAT TURNS THE WEB INTO A VIRTUAL WORLD

**IN 1984**, William Gibson's science fiction novel *Neuromancer* helped popularize the idea of cyberspace. With the aid of a computer, you could jack into a digitally created alternate universe and connect with billions of people around the world.

This pretty much describes the modern Internet. But JanusVR, a web browsing and design platform co-created by U of T computer science grad James McCrae (PhD 2014), goes a step beyond: It replaces the traditional web with a more interactive and social cyberspace, using virtual reality (VR) headsets like the Oculus Rift.

Put on an Oculus headset and load up JanusVR, and you're plunged into a 3-D representation of the Internet. Instead of watching YouTube clips on a computer monitor, as you do in the real world, you feel like you're sitting on a couch inside a giant personal theatre, watching clips on an obscenely large panoramic screen.

Finished watching? Walk your avatar out the door and you may find yourself in a lobby representing the front page of the social media site Reddit. The walls are lined with more doorways, each leading to another website.

McCrae describes these doorways as a reinvention of browsing the web. "Instead of a piece of text that you click that gives you this discrete jump from one page to another, we thought of this portal, where it's almost like a tear in space. It seamlessly connects two pages that are adjacent," he explains.

This allows you, for instance, to leave the Reddit lobby and find yourself on the surface of Mars, built from maps and high-res images from NASA's website – the planet's mountainous vista in the distance all around you.

Perhaps most importantly, multiple people can inhabit these spaces together, appearing to each other as avatars and interacting with each other just like they would in real life.

McCrae and his team of nine, including co-founder and U of T computer science professor Karan Singh, often find themselves in different places around the world, so they sometimes meet inside JanusVR itself, showing off their newest concepts.

In the four years since it launched, JanusVR has built a dedicated and growing community of fans, users and creators building their virtual worlds, all connected via portal-like doorways. To further democratize the experience – and sidestep the price of VR headsets – McCrae's team has also launched Vesta, a desktop-based method for people to explore these spaces with a regular computer.

McCrae cites *Neuromancer* as well as Neal Stephenson's *Snow Crash* among his strongest sources of "inspiration and excitement" for JanusVR, as "the kind of books that tease [out] the kind of world you long for."

Modern-day VR hasn't yet reached the level of sophistication in cyberpunk novels, but he's optimistic about the progress already under way. Companies such as Oculus are working toward cheaper, lighter and eventually completely wireless headsets. "If we could work out all these limits of current technology, and the hardware was totally amazing, how far could you go?" McCrae asks. "How crazy could it be?"

Holding business meetings or watching YouTube videos in VR isn't as crazy as Keanu Reeves jacking into the matrix and doing acrobatic martial arts. But the technology is still very young.

"The idea was, we're going to deepen the connection between man and machine toward a more natural means of interaction," he says. – **JONATHAN ORE**

NO.5

# SUPPRESSING OUR MOST FEARFUL MEMORIES

RESEARCH ON MICE REVEALS THAT SPECIFIC MEMORIES CAN BE WEAKENED. COULD THIS ONE DAY HELP TREAT THE EFFECTS OF TRAUMA IN HUMANS?

**POST-TRAUMATIC STRESS DISORDER** is a malady of memory. Sufferers are often haunted by recurrent nightmares, distressing thoughts and flashbacks so intense in colour, smell and sound that they feel as if they are reliving the trauma.

But what if these unbearable memories could be selectively erased?

Sheena Josselyn, a U of T professor of physiology and psychology, who studies how the brain encodes, stores and uses information, is intrigued by the idea and has been investigating how to "silence" memories – make them temporarily inaccessible – in mice. She thinks it's possible that a variation on this technique could one day help treat post-traumatic stress disorder in humans.

Studies with mice have found that although their brains contain billions of neurons, only a few are necessary to form a fearful memory.

Researchers working with mice began by teaching them to fear a tone: when it sounds, they feel a mild shock to their feet (not to hurt them, just to scare them). The next time the mice hear the tone, they crouch and freeze, signalling fear. The researchers discovered that they could trigger the memory of that fear even *without* presenting the tone. They did this by stimulating the small group of nerve cells holding that memory through a technology called optogenetics. Using the same technology, they found they could also suppress the fearful memory.

With optogenetics, scientists insert proteins into neurons to make them sensitive to light. Depending on the type of protein and colour of light used, these cells can then be activated or deactivated by shining pulses of the light directly into the brain: If the light activates the cells, the mice freeze as if they've just heard the tone. If the light deactivates the cells, the memory is suppressed.

While optogenetics is an invasive procedure and technologically not feasible with humans, Josselyn hopes that the general principles learned from these studies could eventually help scientists create new drugs for treating memory disorders such as post-traumatic stress disorder and Alzheimer's.

But should you erase a bad memory, as Kate Winslet's and Jim Carrey's characters do in *Eternal Sunshine of the Spotless Mind*? Absolutely not, says Josselyn, who is also a senior scientist at Sick Kids. She emphasizes that this future technology should not be applied to everyday bad things, and that "these discoveries need to go hand in hand with a real thinking about the ethics involved in potentially manipulating memories in people." Their use would only be considered in extreme cases, after all other treatment options have been explored, with patients suffering such debilitating pain that it interferes with their daily activities – in the case of a rape survivor or somebody coming home from combat, for example. The goal is not to sanitize life or make people super happy, but rather to "make everyone a functional person, capable of moments of joy." – **MANINI SHEKER**

# WITH DAMAGED ORGANS, A CHANCE FOR "REGROWTH"

## PROF. MICHAEL SEFTON IMAGINES BEING ABLE TO TREAT DIABETES WITH A SINGLE INJECTION

**EVER SINCE 1961**, when U of T scientists published a landmark paper about the potential of stem cells, researchers in regenerative medicine have been trying to figure out how to use these cells to replace damaged tissue or organs.

Michael Sefton, the executive director of U of T's Medicine by Design, focuses on new treatments for diabetes. People with diabetes can't produce the insulin they need to regulate their blood sugar levels. Left untreated, the condition causes nerve and vascular damage, and raises the risk of heart disease, stroke and even blindness.

Sefton, a University Professor in chemical engineering and at the Institute of Biomaterials and Biomedical Engineering, is developing a technique that could someday treat diabetes with a single injection. He is creating tiny capsules that could be injected into a patient with diabetes, where they would deliver special pancreatic cells capable of restoring proper insulin function.

As Sefton explains, the capsules, made of collagen, are a few hundred microns in size – small enough that they can pass through a syringe needle. Each one contains clusters of about 3,000 pancreatic cells called "islets" that regulate insulin production. Sefton says the cells will eventually be engineered to prevent the patient's body from rejecting them.

A challenge for Sefton and his research team is that people with diabetes suffer damage to their blood vessels, which makes it nearly impossible for the islets to do their intended job. Think of transport trucks (the capsules) trying to drive on an unpaved road (the damaged blood vessels). The capsules also have to be engineered to trigger the growth of healthy new blood vessels – akin to the transport trucks generating a freshly paved highway for themselves.

By the time the research is complete, the islets will be "retooled to maximize their performance," Sefton says, allowing them to survive the initial and most difficult phase of their journey into the body.

So far, Sefton and his team have been refining the process on diabetic mice. With funding from the Juvenile Diabetes Research Foundation, the next phases – which will take about two years – involve perfecting this technique for rats and then pigs. "It should work in rats but it's not clear it will scale to pigs," he says. With larger animals, the therapy requires hundreds of times more injectable cell-containing modules, as well as methods that ensure these tiny "trucks" are deployed properly in the patient's body.

As Sefton points out, regenerative medicine has made great advances, but the tissues that have seen the greatest success – such as joints and bones – tend to be less complex, with fewer cells. The islet modules, though still in early development, point to the next chapter in regenerative medicine, which will target more complex types of organs and tissues. It's a future that could even see cellular machines zipping through our veins, helping to fix stuff.

**– JOHN LORINC**

SO FAR, SEFTON AND HIS RESEARCH TEAM HAVE BEEN REFINING THE PROCESS ON DIABETIC MICE. WITH FUNDING FROM THE JUVENILE DIABETES RESEARCH FOUNDATION, THE NEXT PHASES – WHICH WILL TAKE ABOUT TWO YEARS – INVOLVE PERFECTING THIS TECHNIQUE FOR RATS AND THEN PIGS

NO.7

# A WAY TO MAKE THINGS DISAPPEAR

PROF. GEORGE ELEFTHERIADES IS DEVELOPING A RADAR-EVADING TECHNOLOGY THAT HE THINKS COULD BE USED ONE DAY TO MAKE ANYTHING INVISIBLE

**IN THE WORLD OF HARRY POTTER**, wizards who want to disappear simply put on a magic cloak that renders them invisible.

No such garment exists in our world (yet), but a U of T engineering professor is working on a material that could be wrapped around an object to make it undetectable to radar. And he thinks the same technology could be used to make anything – even a human being – invisible to the naked eye.

"It's a matter of putting the resources together and focusing on that goal," says George Eleftheriades, who is also director of the Centre for Reconfigurable Electromagnetic Surfaces.

Making an object invisible – whether to radar or the human eye – relies on the same principle of reflection.

When light hits an object and bounces back, the eye sees the reflection. In the case of radar, an antenna sends out radio waves that hit an object and then bounce back to a receiver. This equipment can determine the size, range and speed of the object and then present the information on a screen.

Some airplanes use "stealth technology" comprising a unique shape and surface material to absorb and redirect the radio waves. But they can still be illuminated by radar devices acting together from different angles.

The innovation Eleftheriades and his researchers have developed is an "active cloaking technology" that uses tiny antennas to emit signals matching the radar wave frequency. This leaves the incoming waves undisturbed. "It's as if the waves are passing right through the object," says Eleftheriades.

Over the next two years, he and his research team plan to develop a thin, flexible material embedded with these antennas that could be wrapped around any size or shape of object to hide it from radar.

They are also working on fine-tuning the cloaking signals so they can be adjusted in real time to match different incoming radio waves – much like how noise-cancelling headphones mute fluctuating sound waves.

Although the technology's military applications are clear, Eleftheriades sees potential commercial uses as well. For example, structures that impede cellphone transmissions could be cloaked to allow these signals to pass freely.

Adapting the technology to make objects invisible to the human eye would be more complex but far from impossible, he says.

Instead of using microwaves to cancel incoming radio waves, the antennas would emit waves of light to match and cancel any visible reflection travelling back to the human eye.

The challenge is huge: there would have to be millions of antennas embedded in the material (instead of thousands) and they would have to be much smaller. The cloak would need a reliable power source and would have to be able to match incoming light waves as they fluctuate in real time.

To be practical for humans, the cloak would also have to be extremely thin and flexible. "But we could do it in five to 10 years with a dedicated effort," says Eleftheriades. "A computer chip has billions of transistors in it, so we already have shown we can master this kind of complexity and scale."

**– PETER BOISSEAU**

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# All About Alumni

**"It's about the existential monsters that keep us up at night, staring at the ceiling – harder to slay than your regular monsters"**

Judd Palmer on his new puppet show, *Jabberwocky*
**p. 51**

Aida Edemariam

## The Wife's Tale

### In her new book, Aida Edemariam shares stories of her grandmother, who survived violence at home – and civil war

**WHEN AIDA EDEMARIAM (MA 1996)** was growing up in Addis Ababa, Ethiopia, her grandmother would regale family and friends with stories during the daily coffee ceremony – an Ethiopian ritual – at Edemariam's home. As the coffee beans crackled in a pan over the fire, and the rich smell of freshly roasted coffee rose, Edemariam – in the manner of all clever children – sat silently to better eavesdrop. "Coffee was a forbidden thing for children, and I'd sit there and see how much I'd be allowed to get away with, and listen," she says. Her grandmother, Yetemegnu, was a natural raconteur, and Edemariam began taping their conversations when she was in her 20s.

Edemariam captures her grandmother's life in her first book, *The Wife's Tale: A Personal History*. Yetemegnu lived until the age of 98, and her stories – those of a woman without political power – are often those lost to history. She talks of being married by the age of eight to a cleric 20 years her senior. (No one told her she was betrothed: "Why would anyone bother to tell a girl child?" writes Edemariam.) Of giving birth to the first of her nine children at the age of 14. Of physical violence at her husband's hand – and of standing up to him when she was in her mid-20s. Of surviving civil war. "It's a woman's encounter with history. Women live war differently, and rarely does anyone tell it from their point of view," says Edemariam. "I wanted to take a woman's experience as seriously as somebody would tell the story of an emperor."

The book was also a chance for Edemariam, a writer and editor for the *Guardian* newspaper in London, to revisit ›

PHOTO: TORI FERENC

## Tackling Football's Ratings

### Maryann Turcke is finding new ways to attract viewers to the NFL

Maryann Turcke

**SINCE JOINING** the National Football League as president of digital media and the NFL Network, Maryann Turcke (MEng 1993) has been trying to tackle an unusual problem for America's most popular sport: declining viewership.

TV ratings for NFL games were down seven per cent in 2016 and 10 per cent in 2017. Turcke says this is largely due to evolving viewing habits influenced by mobile technology, social media and web streaming trends. Super Bowl 2018 viewership stats seem to confirm her assertion: TV viewership was down eight per cent over the previous year, but it was the most live-streamed Super Bowl ever. "The way audiences consume content is changing," she says. "We have to adapt our strategy to follow them where they go."

Turcke says her engineering education equipped her with the expertise to manage large projects and use data analytics in decision-making. And as the president of Bell Media, she modernized CTV's morning show.

Turcke oversees the NFL Network, which is distributed over cable and satellite platforms, as well as NFL Films and NFL.com. With her team of 700, one way she is growing the NFL's popularity is by producing compelling stories about players' lives and their community work. Her strategy also includes increasing distribution on digital sites, such as airing football games live on Amazon. "At Bell, our philosophy was: pick a screen and fill it with goodness," she says. "We want fans to get the content they want – games, statistics, commentary – anywhere and any time." – **SHARON ASCHAIEK**

## NFL Stats

**Maryann Turcke shares some fast facts:**

The NFL champions kids in multiple ways: it has invested $45 million in youth football initiatives such as coaching, equipment and grants. It has also developed 494 football fields across America.

Women comprise 35 per cent of all full-time employees at the league's office and 28 per cent of its senior leaders – plus 45 per cent of its fan base.

More than 5,800 media outlets from approximately 25 countries covered Super Bowl LII.

her own childhood. The daughter of two doctors – her mother is from Canada, and met her dad in Montreal while they were both medical students – Edemariam lived in Ethiopia until she was 15. After a stint at boarding school, she attended the University of Oxford and then earned a master's degree in English from U of T. Edemariam came to the university because of her interest in the Romantics and poet Samuel Taylor Coleridge, whose papers reside at Victoria College. During her time in Toronto, Edemariam also discovered U of T alum Michael Ondaatje's *Running in the Family* – his memoir of returning to his childhood home of Ceylon (now Sri Lanka). "He wrote, 'In my mid-thirties, I realized I had slipped past a childhood I had ignored and not understood' – and he wanted to go back to Sri Lanka to see what his childhood was," says Edemariam. "I went back to write about my grandmother, but, quite late in the process, I realized I was doing something similar."

Edemariam draws an expansive, full-bodied portrait of Ethiopia, detailing its landscape, people and 20th-century history – as it shifts radically from a deeply hierarchical country under emperorships, through a Marxist revolution, to an ostensible democracy in the '90s. "People have very knee-jerk assumptions about Ethiopia. They assume wastelands and it's not like that. It's a very rich place," she says, referencing the culture, language and scenic beauty.

Near the end of the book, Edemariam describes taking her then-two-year-old daughter to Ethiopia. Her daughter, too, watches coffee beans roasting in a pan over the fire and listens to the stories of her great-grandmother, then in her 90s. While Yetemegnu is frail and less talkative, her personality is still emotionally open. "When most people grow up, they almost grow a carapace to protect their feelings. She *inhabited* her feelings," says Edemariam. "She was capable of unconditional love – which you don't come across very often." – **STACEY GIBSON**



PHOTO: LEFT, RICHARD FREEDMAN; RIGHT, ISTOCK

**OVERHEARD**

> We *hibakusha*, the survivors of Hiroshima and Nagasaki, believe that no human being ever again should have to experience the inhumanity, immorality and cruelty of an atomic bombing. Our mission is to warn the world about the danger of this ultimate evil.

Setsuko Thurlow (BScSW 1956, MSW 1960), who has campaigned extensively for more than seven decades to eliminate nuclear weapons, at the Factor-Inwentash Faculty of Social Work's Alumni Distinguished Speaker Series in March. In 2017, Thurlow accepted the Nobel Peace Prize on behalf of the International Campaign to Abolish Nuclear Weapons. She's pictured here at her home in Toronto.

PHOTO: CHRIS THOMAIDIS

Laura McGee has compared #GoSponsorMe to the ice bucket challenge – after a senior leader signs on, he or she tags two or three others to encourage them to become sponsors

Laura McGee

# A Professional "Safe Space" in the #MeToo Era

## U of T alumni created #GoSponsorHer to advance women's careers

**LAURA MCGEE (JD 2014)** had been in the workforce for less than a year when she noticed how "outdated biases" about male-female working relationships – among both men and women – were limiting the career success of young women like herself. "Research shows that many men and women are reluctant to spend time alone together outside of work," she says. "But business success is about building relationships, so these self-imposed rules make it harder to get ahead."

Last year, McGee launched the #GoSponsorHer social media campaign with Megan Anderson (BComm 2014 St. Michael's), a former colleague at McKinsey & Company. (They've both gone on to new ventures.) #GoSponsorHer asks male and female senior executives to "sponsor" – actively champion the career advancement of – a promising woman in their industry, post their pledge on a social media site such as Twitter and then issue the same challenge to two or three colleagues.

The problem that #GoSponsorHer aims to address, says McGee, is that women are half as likely as men to have sponsors in many business and professional fields. Research also shows that two-thirds of senior men and one-half of junior women are reluctant to form sponsorship relationships because they may be misconstrued as sexual. "The public nature of #GoSponsorHer gives people a safe space," says McGee. "With the rise of the #MeToo movement, we're doubling down on our campaign to try to avoid a chilling effect, where men avoid sponsoring women."

The difference between sponsorship and mentorship, says McGee, is that a mentor talks *to* you, while a sponsor talks *about* you – showcasing your skills and successes. Her current sponsor is Mark D. Wiseman (JD/MBA 1996), a senior managing director at investment firm BlackRock, Inc., whose support has ranged from key introductions to direct advocacy. "He also spoke on an International Women's Day panel I organized at Rotman," she says. "It drew a huge crowd and really helped our cause. He even made a point to publicly praise my work on stage."

Sponsors also use their networks to open doors. But McGee is quick to point out that sponsorship is not an act of charity, because women work hard for their sponsors by supporting their professional priorities. "I spent countless nights perfecting slide decks, gathering data for a project and going the extra mile for one of my first sponsors, for example, and he created many opportunities for me to get ahead," she says.

So far, more than 150 CEOs as well as other executives, mostly from North America, have joined #GoSponsorHer.

**– MEGAN EASTON**

## Hope Floats

Kerri Sakamoto

After learning that visionary architect Buckminster Fuller had a Japanese-American business partner, Kerri Sakamoto's imagination took off – inspiring a fable-like tale that isn't intended to follow history as it actually happened, but "imagine a story that might have been."

Sakamoto's newest novel, *Floating City*, follows the story of Frankie Hanesaka who, after being displaced from his home time and again, rises to success as a property developer. Forced from his floating house off Vancouver Island to a Japanese internment camp during the Second World War, Hanesaka moves to Toronto after the war. He meets Fuller, who envisions building a floating community in Toronto Harbour – and who teaches Hanesaka that he "must dream and dare."

"I wanted to detail the past, but also point to the future," says Sakamoto (BA 1982 UTM), whose own parents and grandparents avoided talking about their time in internment camps while she was growing up in Etobicoke, Ontario.

Sakamoto wanted to explore Hanesaka's experience of living through perpetual racism, and what it means to negotiate one's manhood and dignity – as a husband, father and provider – in the face of persecution. The novel also examines what is gained and lost in the name of "progress," both in the sense of urban gentrification and Hanesaka's assimilation, says Sakamoto. "*Floating City* is a cautionary tale, but also one of utopic ideals." **– NADIA SIU VAN**



PHOTO: BOTTOM, DANIEL TISCH

Judd Palmer co-wrote his first play for the Trinity College Dramatic Society: it was about a former Czech Republic president, whom he fashioned as a foam rubber "gruesome Muppet" whose head sat in a jar on centre stage

MY DEFINING MOMENT

# "Everything in Life Requires Confidence"

## How a U of T prof taught Alison Wiley the art of negotiation

**MY MBA EDUCATION** provided me with something essential: self-confidence. In a second-year course on business negotiation, I learned a lot from Prof. Glen Whyte about securing a fair salary. We went over tactics, and role-played scenarios where I presented opening positions and what to do if I didn't get my ask. We spent a lot of time practising, and I received constructive feedback from Glen – it was excellent training.

One assignment was doing a real negotiation in our lives. I had just been offered a job at Weston Foods' head office, and I discovered a classmate was offered a similar job there but would be paid significantly more than me. I decided to try to renegotiate my salary. I reviewed my class notes, and when I walked into the boss's office, I was prepared to make my case. Thankfully, he absolutely agreed with me. He checked into the discrepancy with HR, and had my pay increased to the same level. It was such a positive experience.

I went on to work at Weston Foods for 10 years, and built a rewarding career in operations and brand management. In 2008, I started Live Out Loud Adventures, a company that specializes in leading classic hikes around the world. We not only guide, but we train and prepare you to be the best you can. I also enjoy being an athlete, and finished fourth in my age group at the 2010 and 2011 World Triathlon Championships. Everything in life requires confidence, especially in business. Confidence is an accumulation of positive moments, such as that experience in my MBA class. Glen built me up, and now I try to do the same for my travel clients – I get them to see they have what it takes.

**– ALISON WILEY (MBA 1991), AS TOLD TO SHARON ASCHAIEK**

### The Monsters in Your Head

Judd Palmer (BA 1995 Trinity) heads the Old Trout Puppet Workshop, a troupe in Calgary that creates dark, peculiar puppet shows. The Trouts' newest production, *Jabberwocky*, takes place at a surreal crossroads between the real world and Lewis Carroll's work, says Palmer. The play draws on inspiration from Carroll's poem of the same title: Pa, Ma and Son (right) are monster slayers seeking to destroy the Jabberwock. On the way, they encounter many strange creatures, from the Bandersnatch to the Jubjub Bird.

Palmer, who studied philosophy, points out that the creatures speak to our deepest fears: "It's about the existential monsters that keep us up at night, staring at the ceiling – harder to slay than your regular monsters."

The set design was inspired by two Victorian conventions: miniature cardboard toy theatres found in many 19th-century drawing rooms, and moveable panoramas (scrolling canvas backdrops). And Carroll's poem, one of the most renowned examples of total gibberish in the English language, allowed the Trouts to be creative in adapting it for the stage. "It conjures more questions than answers – which is to say that it's equal parts ridiculous and mysterious," says Palmer.

After performing throughout western Canada, the Trouts will start touring *Jabberwocky* in Europe in May. **– NADIA SIU VAN**

Not your average bunny family: Ma, Pa and Son are monster slayers

PHOTO: TOP, KATE WILEY; BOTTOM, JASON STANG PHOTOGRAPHY

Kyla Fox

FIRST PERSON

# A Prisoner No More

## For Kyla Fox, an eating disorder felt like a life sentence. Now recovered, she helps other people overcome theirs

**I WENT TO PRISON** when I was 18 years old.

I remember the excruciating fear I felt every single day of my sentence. I remember the rules I had to follow, the inability to say and be who I was. I remember going to sleep at night wondering if I'd be alive in the morning. I remember thinking I would never get out.

This wasn't the kind of prison I was bused to in an orange jumpsuit and shackles after being found guilty. Nope. This wasn't a huge concrete building surrounded by barbed wire and divided into cells. This prison was my mind. This prison was my eating disorder.

I suffered with severe anorexia and an over-exercise addiction in my late teens and early 20s. The deadly combination of having to exercise as much as possible while eating as little as I could was my sentence. I tried to manage my insecurities and feelings of worthlessness by "managing" food and my body. The desperate state of my health – risk for heart attack, arrhythmia, kidney failure, infertility; the presence of hypoglycemia, fainting spells, hair, bone and energy loss; and the loss of *myself* entirely – meant intervention was critical. However, the lack of treatment options, lengthy waitlists and unseasoned professionals who claimed to be experts meant I was at a standstill. With these gaps in services, I – with the unwavering support of my family – created "treatment" in our home. My family supervised my meals so that I would show up to the food, not be sneaky, and get the emotional support I needed after I ate when I was often overcome with anxiety. My parents implemented clear limits on my exercise regimen (basically no exercise until I was cleared medically). But boycotting my symptoms with food and my body meant I needed to confront my deepest emotional wounds, familial circumstances (including my parents' divorce), relational trauma and negative self-concept. I did this through journalling, reading, talking with family members, confronting people who had hurt me and using my voice.

Recovering from an eating disorder is a gruelling and exhausting experience, and requires so much perseverance. For me, the first three years encompassed severe depression and anxiety, fear and immense self-loathing. For the first year, I did nothing but recovery. Until I reached a new level of physical and emotional stability, I was doing all recovery all the time.

As the darkness began to clear, I enrolled in a women's studies course at U of T. I remember walking into a class full of dynamic and diverse women: women who said what they felt and owned who they were. I was still ill, meek and insecure but I wanted to be just like these women. Slowly I began to immerse myself in academia. Tapping into my intellect made me feel confident, and university gave me purpose. I began to realize my passion: to work with those affected by eating disorders. I felt called to become the therapist who I always wanted when I was ill. I knew that I believed in a holistic approach to healing, and a professor suggested I apply for my master's of social work. After completing my BA in women's studies and drama, I went on to earn my master's degree at U of T in 2006.

For years, I ran a private practice specializing in eating disorders. In 2012, I opened The Kyla Fox Centre – which treats the entire spectrum of people affected by eating disorders and disordered eating – to help close the many gaps in services in Toronto. The centre is designed to meet the unique recovery needs of every single person who suffers, whether that be through a more intensive program (10 hours a day, seven days per week) or less frequent care. We never lose sight of the human being that lives within the struggle.

I am also a public speaker, writer and advocate for eating disorder awareness, recovery and women's health. It matters to me to speak honestly and loudly about my work and my life so that I can be a part of ending the stigma surrounding mental health and encourage women to stop being so afraid of who they really are. My work reminds me every day that I am grateful I made it through and honoured that I get to witness so many people living free again.



PHOTO: STEPHANIE BONUS

The late U of T alum William Hutt was one of Stratford's leading men for 50 years. He told *U of T Mag* in 2003 that he stayed because, "I was associated with the greatest playwright in the English language and with a company that produces his plays with love, passion and a good budget"

Nora Polley

60 SECONDS WITH

# Nora Polley

## Stratford's secret weapon

After more than 50 years at the Stratford Festival, **Nora Polley** (BA 1969 Trinity) is the distinguished summer theatre's longest-serving employee. Currently working in the archives, Polley spent 37 seasons as a stage manager. Her memoir, *Whenever You're Ready* (written by Shawn DeSouza-Coelho and out in May), recounts a life spent running shows with razor-sharp precision. Here, she calls the cues with **Cynthia Macdonald**.

**Not much is known about stage managers. But they're said to be the glue of any production.** Good stage management is invisible: an audience should never be aware that there's a "man behind the curtain." In the theatre, all you need is a good story and good actors. For any production though, the stage manager is probably the biggest cheerleader.

**It doesn't seem fair! You quote former Stratford stage manager Thomas Bohdanetzky who said, "If you want a pat on the back, grow your arm."** True. He also said, "If anyone notices you are doing your job, it will be because you just made a mistake."

**Still, you got to see some of the great moments in Stratford history. Is it true that William Hutt actually announced Paul Henderson's goal in the 1972 Canada-Russia Summit Series – from the stage?** It was a matinee full of kids, and the audience was not particularly attentive. I mean, their minds were not exactly on *King Lear*! So he stopped the show and gave them what they wanted. Naturally, they gave him a standing ovation at the end.

**One of your favourite memories was watching Martha Henry rehearsing *Measure for Measure*.** Her character was a nun, who's told she can have her brother's death sentence commuted if she sleeps with an official, played by Brian Bedford. For this particular rehearsal, the director had put a pitcher of water on the desk where she was sitting. After Brian exited, Martha sat looking at it for a long time. Then she got out her handkerchief, plunged her arm into the pitcher and mopped her face and hands, as if she'd been violated. It was absolutely mesmerizing. Martha is a great actor. She would repeat that moment at every performance, but it would never again be the first time – and I was there. That's what I miss about stage managing: I miss actors.

**There's a lot of talk now in the theatre (and elsewhere) about abuse. Early in your career, a director asked you to tie an actor to a chair during rehearsal: he thought this unorthodox technique would improve the actor's performance.** Obviously it was the wrong thing to do, and if the actor had said to me, "Please don't do that," I like to think I wouldn't have done it. The director is the most important person in that room. I've been in rehearsals where they've screamed, told off-colour jokes, behaved in a vulgar fashion. You want genius; unfortunately you sometimes get those other things, too.

**Shakespeare wrote almost 40 plays, yet audiences seem to want the same ones over and over (I'm looking at you, *A Midsummer Night's Dream*).** When he was artistic director, Richard Monette announced at a company meeting that he wanted to stage all of Shakespeare's plays. I was the only one who applauded. Festival executive Antoni Cimolino's response was: "*You* try selling tickets to *Troilus and Cressida*!" But now, Antoni's the artistic director. He's in the same boat, because he's announced his intention to film them all. And I think that would be fantastic.

PHOTO: ANN BAGGLEY

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St. Mike's students at a Football Dance in Brennan Hall, 1950.

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Closed-circuit television allowed library students to practise their presentations, and professors to record their lectures

**YOUR EDUCATION WILL BE TELEVISED**

## 1968

A U of T library student delivers a high-tech talk

In the late 1960s, closed-circuit television offered faculty members at the U of T Library School (now the Faculty of Information) a novel way to support their teaching. This photo illustrates two ways faculty used the technology: to train students to operate the equipment and to record presentations – allowing students to see themselves on screen and improve their delivery. Profs also recorded their own lectures for viewing.

The reel-to-reel video recorder pictured here used one-inch reusable magnetic tapes to capture up to an hour of footage. "It was the latest and best video technology for industrial and educational use in 1968," says Keith Thomas, a former lecturer in the faculty. It was also considered relatively sleek. The owner's manual for the product – the Ampex VR-7000 – noted that it was "portable" at 100 pounds.

In January 1969, the Media Centre opened in the old Library School building at 256 McCaul St. under the direction of Prof. Donald J. Forgie. "Don was a great proponent of TV as an educational technology," says Thomas. When the new Library School at 140 St. George St. opened in 1971, Forgie was instrumental in creating a professional quality recording and editing suite with cable distribution to classroom TVs.

In the 1980s, Thomas collaborated with Forgie on adapting a crossover technology called Telidon, which combined features of television, phones and computers. "It seemed to have some promise for distance education," says Thomas, "but of course the Internet blew it all away." The Ampex VR-7000 now resides in Media Commons – a testament to technology's longstanding and essential role in library science. – **MEGAN EASTON**



PHOTO: U OF T ARCHIVES, 2009-70-1MS

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