RESEARCH & INNOVATION
U of T SCARBOROUGH

2016-17

Office of the Vice-Principal Research
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In September, Reuters released its Top 100: World’s Most Innovative Universities list. We were delighted — though perhaps not so surprised — to see that the University of Toronto ranked first in Canada and in the top 30 in the world.

U of T Scarborough supports this reputation through our research excellence, and by the fact that our researchers ask fundamentally important questions at the forefront of knowledge and application, like: How do we respond to the invasion of Asian carp in our rivers and lakes? How do hiring practices affect an organization’s reputation? What are the toxins in our soil doing to us? How can innovative mobile technology be useful to artists on the stage, and what role can theatre play in integrating marginalized populations? These are just a few of the questions highlighted in these pages, which together represent an overview of the work that’s being done on our campus.

Through innovative thinking and the use of state-of-the-art equipment, our faculty are tackling questions that will help to solve some of the most challenging problems of our time. Our laboratories and research groups such as the Environmental Nuclear Magnetic Resonance Centre, the Integrative Behaviour & Neuroscience Group or the Centre for Ethnography are platforms for discoveries involving international collaborators, and have a global impact in the research community.
Together with our graduate and undergraduate students, our growing academic complement includes a mix of world-leading experienced investigators as well as a new generation of some of Canada’s most promising young researchers.

Our impact within the local community is no less significant than it is nationally and internationally. Our partnerships with organizations such as the Toronto Zoo, Parks Canada and the East Scarborough Storefront benefit our nearby communities, but also generate knowledge and innovations that can improve the lives of people across Canada and around the world.

I invite you to discover some of our notable award-winning researchers in this publication and, in our back pages, see the broad range of discovery that defines us as part of the most innovative institution in Canada.

Marc Cadotte,
Acting Vice-Principal Research
IMPACT OF RESEARCH AND INNOVATION @ U OF T SCARBOROUGH IN 2016-17

239 Research faculty

281 research grants and contracts worth $12.8M

2016-17 NSERC DISCOVERY GRANTS AND SSHRC INSIGHT GRANTS SUCCESS RATES

- **NSERC Discovery** UTSC Success Rate: 80.0%
- **NSERC Discovery** U of T Success Rate: 71.3%
- **NSERC Discovery** National Success Rate: 66.5%
- **SSHRC Insight** UTSC Success Rate: 45.5%
- **SSHRC Insight** U of T Success Rate: 37.8%
- **SSHRC Insight** National Success Rate: 40.0%
Graduate students and fellows supervised by U of T Scarborough faculty:

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Publications, January 2016 to June 2017:

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13 prestigious faculty research awards

60 student research awards sponsored by the Office of Vice-Principal Research

$1.1 million combined revenues of startup businesses in The Hub, the entrepreneurship incubator, since 2015

$2.5 million combined follow-on capital investment in two rapidly growing startups

1300 student participants in The Hub’s events since 2015

72 companies formed since 2015

Every dollar given multiplied by 10
OUR STORIES
UNDERSTANDING BACTERIAL ATTRACTION

What's a microbe like you doing on a surface like this?

That's what chemistry professor Ruby Sullan asks each time she enters her lab in the new Environmental Science and Chemistry Building at U of T Scarborough. Sullan studies the mechanisms that cause a single bacterial cell (a bacterium) to stick to a particular surface.

Out in the world, once one bacterium sticks more tend to follow. The bacteria create elaborate adhesion structures, eventually forming a “biofilm” that covers the whole surface. And problems can ensue.

Biofilms cover medical instruments, putting hospital patients at risk of infection. They eat away at plastic and rubber parts of aircraft fueling systems (microbial-induced corrosion). They coat human teeth and cause decay — dental plaque is a biofilm.

Biofilms involve complex interactions. But Sullan says it’s crucial to study the initial stage, when the single bacterium first attaches. “When we know how this works at the nanoscale level, then we know how to interfere with it.”

Her technique involves an atomic force microscope that lets her “get up close and personal” with a bacterium. “We study hard surfaces versus soft. Charged and non-charged. Polar and non-polar. It gives us fundamental mechanistic insights.”

Sullan’s research could help in the development of coatings to stop biofilms from forming.

BOOK GOES UNDERCOVER

In Under the Cover: The Creation, Production, and Reception of a Novel, Clayton Childress goes behind the scenes in Cornelia Nixon’s historical novel Jarrettsville.

Published this year, Childress’s book is much more than a case study; it uses Jarrettsville as a window into places we usually can’t see.

A sociology professor at U of T Scarborough, Childress used interviews, ethnographic field work and survey data to explore the production and reception of culture. He studied author communities — writing isn’t as lonely as it looks, he discovered — and the complex world of publishing. There, he found that “part of doing ‘good work’ means publishing books you can personally relate to and root for.” But some voices get shut out.

Jarrettsville provides a case in point.

Nixon’s initial draft, told from a female perspective, wasn’t picked up by publishers. So in her next draft she gave equal weight to a male point of view.

Childress notes that the editor who accepted Jarrettsville “says he felt like the main male character was a friend he could relate to.” That editor was actually doing “good work,” Childress adds. But it shows why diversity is needed in these positions — to avoid “the massive under-representation of stories by people who don’t look, sound, or think like typical acquisitions editors.”
THE COSTS OF FRAGMENTING HABITATS

What happens to birds when you flood their habitat? Marc Cadotte, a biology professor at U of T Scarborough, says you stand to lose biodiversity in two ways. You lose raw diversity (that is, you have fewer species) and those that remain are very similar to one another.

A recent study, led by Cadotte’s postdoctoral researcher Xingfeng Si, looked at China’s Thousand Island Lake area. In 1959, a large forest was flooded for hydroelectric production. The tops of hills and mountains suddenly became islands.

Si says the area offers a unique look at what happens to wildlife when natural habitats are fragmented by human activity. For some birds, the islands were too small for nesting or finding food. On the nearby mainland there are now 55 species of terrestrial breeding birds, but on the islands it ranges from 20 to 44.

Studies like this one — co-supervised through Zhejiang University — show what happens when we fragment habitats.

“We have a lot of uninterrupted forests in Canada,” says Cadotte. “But that’s changing. We’re moving further north, tearing up forests. We should be asking, are we happy with this arrangement? Is this what we want?”

TUNING INTO THE ETHICS OF THEATRE

Barry Freeman says theatre can — and should — bring strangers together.

His new book, Staging Strangers: Theatre and Global Ethics, focuses on Toronto, “where artists are increasingly telling stories about distant strangers elsewhere in the world.”

Freeman, a Theatre and Performance Studies professor at U of T Scarborough, defines “stranger” as someone on the threshold, “perhaps looking to be welcomed, though perhaps never quite admitted.”

And Canada’s dominant culture often hasn’t helped. “My students are always stunned,” he says, “to learn that up until the 1950s, the so-called Potlatch ban under the Indian Act actually made some traditional forms of Indigenous performance illegal.”

Other marginalized people have sometimes maintained their own performance traditions. In what Freeman calls “church basement globalism,” amateur theatre groups present work within specific cultural communities.

“If you learn more about these groups, you see that they aren’t strictly ‘local’ at all,” he says, “but very importantly globally connected to the culture and politics in their homeland.” This tradition continues, but is changing in response to a more globalized world. Companies such as Cahoots Theatre, Why Not Theatre and the Debajehmujig Storytellers generate understanding across cultural divides.

“Some theatre seemed to me to be calling on its audience to see, know, feel for and care about distant strangers in some way,” says Freeman. “Staging Strangers is about trying to tune into the ethical nature of the art in how it’s realized between the stage and audience.”
ON THE RHODES WITH DIANA FU
Diana Fu, now a political science professor at U of T Scarborough, was a Canadian Rhodes Scholar (Prairie region) in 2006.

In 2014 she held a workshop encouraging U of T Scarborough students to apply for the prestigious award, and last year she sat on the Rhodes Scholarship panel for China. Fu, who is a first-generation immigrant from China, was joined on the panel by James Fallows (a Washington-based correspondent for The Atlantic) and former NBA star Yao Ming.

The most recent Rhodes Scholar from U of T Scarborough was Wojciech Gryc in 2007.

Fu says all students should be informed: “Sometimes students with more privileged backgrounds just tend to know about these opportunities, more than other students who maybe do not have the same social capital, connections and networks.” She plans to hold more workshops in future.

ALUMNA HOPES TO HELP AFGHAN-CANADIAN YOUTH ACHIEVE MORE
Hossai Furmli (BSc, 2014) has often excelled in her studies. But she says she would look around and “never see other Afghans there with me.”

She wanted to know why. Furmli won a research grant in her final year at U of T Scarborough and did a qualitative study. Toronto school board data showed a low literacy rate among Afghan immigrants, and Furmli interviewed several young people to look for reasons.

“It’s not that we don’t have aspirations,” she concluded. “It’s that we don’t have a realistic way of achieving them.”

Furmli is now a medical student at the University of Ottawa. In 2016, she presented a poster of her undergrad study at an Action Global Health Network Conference (showing links between education and health).

She hopes to distribute the data to local organizations who can use it to help Afghan-Canadian youth.
LIVES OF CAREGIVERS AFFECT RELATIVES WITH DEMENTIA

Dementia patients are likely to die sooner if their family caregivers have poor mental health. So shows a new study from the University of California, Berkeley, co-authored by Brett Ford, a U of T Scarborough psychology professor.

“These findings suggest that by improving the lives of caregivers, we can also improve the lives of patients,” says Ford.

The study tracked 176 patients with neurodegenerative disease and their caregivers (mostly spouses, but some adult children and siblings). After accounting for other risk factors — e.g., sex, age and subtype and severity of disease — it found that patients whose caregivers had high levels of mental health problems such as anxiety and depression were about 1.5 times more likely to die sooner. The reasons include more likelihood of neglect, weakened bonds (which, in relationship partners, can predict poor immune system function), more stress and the mimicking of unhealthy behaviour. And there’s a vicious-circle element: additional research cited by the study showed that caregivers are four times more likely than others to be depressed.

“It may be useful to view the caregiver and patient as an interconnected system,” says Ford, “where both can influence each other’s lives in powerful ways.”

HOW CHRONIC HEALTH PROBLEMS AFFECT MENTAL HEALTH DURING PREGNANCY

Hilary Brown has received major funding from the Canadian Institutes of Health Research to study mental health risks for pregnant women and new mothers who have chronic physical conditions.

In general, people with such conditions tend to have poorer mental health; and people with poorer mental health, if they have chronic physical conditions, tend to develop more complications. Brown, a health studies professor at U of T Scarborough, says these links have been nearly ignored in perinatal populations.

It’s surprising, she says, because pregnancy brings changes and risks — physical, hormonal, social and financial — that can trigger depression, anxiety and other mental health issues.

Brown and her team will look at physical conditions that are common among women of childbearing age, including diabetes, hypertension, asthma and autoimmune disorders. They’ll track medical and socio-economic data and assess issues ranging from poverty to poorly managed chronic conditions to the impact of specific medications.

They hope to identify groups of women who should be monitored closely, and give clinicians data they can use to help prevent and treat perinatal mental illness.

“All the same, I hope this research will benefit the women themselves as well as their infants and families,” says Brown.

ESSAY FINISHED ON IPHONE NETS $33,000 PRIZE

A history professor at U of T Scarborough has won a prestigious international prize — for an essay written partly on his phone. William Nelson’s Five Ways of Being a Painting won the top prize of £20,000 ($33,000 CDN) in the Notting Hill Editions essay competition.

Nelson’s essay explores a subtle experience of estrangement, where people step outside of themselves to reassess aspects of their lives. He started it three years ago, but didn’t commit to finishing it until he heard about the Notting Hill competition. He was busy with a full course load, a family life and the writing of an academic book.

So, he explains, “I set a goal to do a small section each night on my phone.”

At the awards presentation in England, Nelson met the people on the short list — most of them professional writers. That made his win an even greater achievement and surprise.
MEXICO’S SUPERMARKET REVOLUTION

When foreign retailers move into a developing country, household welfare may improve because of a reduced cost of living. So shows a recent study by Marco Gonzalez-Navarro, a management professor at U of T Scarborough.

The study, co-authored with David Atkin of MIT and Benjamin Faber of UC Berkeley, looked at Mexico. It found that prices were 12 per cent lower at large foreign retailers, who also offered a greater variety of goods, better hygiene and more parking. Also, says Gonzalez-Navarro, “prices at local retailers went down in order to compete.” On average, household welfare increased by six per cent.

Were there welfare losses too? Yes, but relatively small. For example, a typical municipality showed a 2.6 per cent reduction in the number of traditional retailers.

Gonzalez-Navarro says many governments in developing countries are “understandably nervous” about opening their retail sectors to foreign competition, fearing the impact on small retailers. But the study found little empirical evidence of widespread job loss or lower local income.

“I think if you were to tell politicians that they could increase household income by six per cent without costing them anything in terms of spending, they would jump all over it.”

PSYCHOLOGY PHD STUDENT HONOURED FOR DEPRESSION STUDY

Receiving an award from the Natural Sciences and Engineering Research Council of Canada is an honour, but ranking third in your category across the country takes it another step. This recently happened to Lê-Anh Dinh-Williams, a PhD student in the Graduate Department of Psychological Clinical Science at U of T Scarborough.

Dinh-Williams is studying the neurobiology of depression. For her master’s degree, she explored how people’s reactions to basic rewards (e.g., winning a card game) can affect vulnerability to depression. “Now,” she says, “I’m motivated to examine whether this also applies to more meaningful sources of positive emotions.”

The department, established in 2013, has 21 enrolled students but has generated more than $1.8 million in student funding. Zindel Segal, Director of Clinical Training, points to the training model: “There are a variety of programs emphasizing clinical training, but ours emphasizes clinical science.” From about 200 applications per year, only five students are admitted.
ACT FAST TO STOP THE GRASS CARP INVASION

The Asian grass carp poses a significant threat to the Great Lakes. This is the major finding of a risk assessment led by Fisheries and Oceans Canada and co-ordinated by the bi-national Great Lakes Fishery Commission. The research team included Nick Mandrak, a biology professor at U of T Scarborough.

Not all invasive species have a high ecological impact, says Mandrak, but grass carp are different. They can consume 40 per cent of their body weight per day, growing too large to have natural predators in the Great Lakes. And they produce a lot of eggs.

The species was brought to North America in the 1960s, used for bio-control mostly in the catfish industry. “They escaped from those controlled environments into the wild,” says Mandrak. They’ve migrated up the Mississippi and been found in Lakes Michigan, Erie and Ontario.

They can decimate wetlands, which are important spawning habitats for native fish. The Vaal River in South Africa lost 13 of its 14 aquatic species of vegetation within two years of grass carp being introduced.

In the Great Lakes, says Mandrak, “the economic impacts would be significant, especially when you look at commercial fishing and tourism.”

On the upside: It’s still early in the invasion curve. The grass carp populations can be eradicated if we act fast. The assessment informs us about the risk, says Mandrak. “Now we need to figure out what next steps can be taken.”

ENGLISH PROF SCREENS SHORT FILM AT TIFF

Daniel Scott Tysdal always dreamed of going to film school. So that’s what the U of T Scarborough English professor did on his recent sabbatical. His short film, Film Frame, ended up being screened at the Toronto Short Film Festival.

Film Frame came from a class assignment to take inspiration from another work of art. Tysdal chose John Barth’s short story “Frame Tale,” which plays on the phrase, “Once upon a time there was a story that began.” The story, he explains, “goes on endlessly in a loop with that phrase.”

Tysdal, who is also a noted poet, echoed Barth in two ways: creating an “endless” film in which each opening scene introduces a new opening scene; and using a “Once upon a time” motif. He also wove in scenes from famous movies. Someone watches the opening of 2001: A Space Odyssey on a laptop. Someone watches the opening of Apocalypse Now on a cellphone on the TTC.

Tysdal found it refreshing to be a student again, and to see teaching techniques from that perspective. “Getting out of your comfort zone to learn something new is important. You don’t know where it will take you.”

“Getting out of your comfort zone to learn something new is important. You don’t know where it will take you.”

Daniel Scott Tysdal
English professor
TECHNOLOGY HELPS UNDERSTAND EFFECTS OF TOXINS

“It’s no longer good enough to say a substance is toxic,” says Andre Simpson. “We need to know what it’s doing to us.” This requires new technology that Simpson and his research team are currently developing with the help of a Strategic Partnership Grant from the Natural Sciences and Engineering Research Council of Canada.

The technology — called a digital microfluidic-microcoil NMR discovery platform — relies on nuclear magnetic resonance (NMR) spectrometers, and this is where the “Strategic Partnership” comes in. Simpson, a chemistry professor at U of T Scarborough, is collaborating with BrukerS, a company that develops magnetic resonance instruments, and with U of T Professor Aaron Wheeler.

So small that it can be described as a chemistry lab on a microchip, the new technology will be powerful enough to interpret how specific molecules in various toxins affect living organisms in real time. As a prime example of its potential, Simpson points to its ability to monitor a change in amino acids, sugars, DNA and other complicated biochemical processes in the body in real time.

“If something is causing amino acids or sugars to rise, and those levels don’t return to equilibrium, we can show that a permanent change in biochemistry took place,” he says. “That’s where we can set evidence-based policies around chronic exposure.”
STARTUP SAVES WASTE
A machine that can turn restaurant food waste into marketable materials is being developed by Genecis, an alumni startup at U of T Scarborough.

Genecis founder and CEO Luna Yu and her four colleagues, all Environmental Science students, are testing a prototype in the Scarborough area. The aim is to convert food waste into a substance that can be collected and sold to companies who will use it to make biofuel, pharmaceuticals and biodegradable plastics — an easy, cost-efficient way to keep commercial kitchen waste out of landfills.

Yu says a single machine will be able to offset 243 tonnes of carbon dioxide emissions every year. “Standard passenger vehicles release 4.7 tonnes of CO₂ every year, which means a restaurant can offset the emissions of 51.7 cars just by using one of our machines.”

Genecis has received mentorship from U of T Scarborough’s entrepreneurship incubator, The Hub, and won top prize at The Hub’s startup competition. In 2017, it placed second in the early-stage category at the inaugural RBC Prize for Innovation and Entrepreneurship, an annual business-pitch competition for innovative technologies and startups at U of T.

BAD EXPERIENCES CAN MAKE YOU MORE EXTREME POLITICALLY
Whether you lean left or right, a new study shows that adverse life events can lead you to a more extreme political position.

“It’s not an on/off switch,” says lead author Daniel Randles, a post-doc in the Department of Psychology at U of T Scarborough. “It’s a slow movement towards either end of the spectrum.”

The study drew on an existing survey of 1,600 Americans who were repeatedly polled between 2006 and 2008 about their political attitudes as well as negative events in their lives. The events included divorce, illness, job loss, injury and assault.

“After facing adversity, these respondents weren’t saying about an issue maybe this is OK. They were either saying this is definitely OK or this is definitely not OK,” says Randles.

As a possible explanation, he points to other research that suggests they may have been looking “for things in the world that are still intact or make sense to them.”

Does Randles’s study shed light on recent political events? He stresses that he’s not a political scientist, but says, “It’s possible that more extreme candidates are becoming popular because the people who support them have a growing number of challenges in their lives.”
TRYING TO REMEMBER SOMETHING? FORGET IT!

Forgetting may be just as valuable a function as remembering. So shows a new study by Blake Richards, a biology professor at U of T Scarborough, and Paul Frankland, a physiology professor at U of T and senior scientist at SickKids.

In the past, it’s often been assumed that forgetting is a failure of the cellular mechanisms involved in storing information. But the reality appears more complex. For example, recent work in Frankland’s lab showed that the growth of new neurons in the hippocampus seems to promote forgetting. Since the hippocampus generates more cells in young people, this may help to explain why we seldom have memories from before age four.

Richards says there are two good reasons for forgetting:

“If you’re trying to navigate the world and your brain is constantly bringing up multiple conflicting memories, that makes it harder for you to make an informed decision.”

The other reason reflects a concept called regularization, used in models for artificial intelligence.

In order to make generalizations based on large amounts of data, there needs to be some forgetting of details. This way, core information can be prioritized.

“The point of memory is to make you an intelligent person who can make decisions given the circumstances,” says Richards. It’s not about “who won the Stanley Cup in 1972.”

If you’re trying to navigate the world and your brain is constantly bringing up multiple conflicting memories, that makes it harder for you to make an informed decision.  

Blake Richards  
Biology professor
3D MODELS OPEN DOORS FOR TREATING DISEASE

Researchers at U of T Scarborough have developed new algorithms that can generate 3D structures of protein molecules. This may revolutionize the development of drugs for diseases from Alzheimer’s to cancer.

“Designing successful drugs is like solving a puzzle,” says Ali Punjani, who helped develop the algorithms. Drugs work by binding to a protein molecule and changing its shape — ideally binding only to the specific protein(s) involved in a disease, to avoid side effects. Punjani, a PhD student in Computer Science, says without knowing the 3D shape of the protein, it’s like “trying to solve that puzzle with a blindfold on.”

Since proteins are tiny, determining their shape requires a sophisticated technique such as electron cryomicroscopy, which produces multiple images of a protein sample from different positions. The computational challenge, then, is to piece together the 3D structure from the 2D images.

The new research solves some of the major problems that existed in the past, says Professor David Fleet, Punjani’s PhD supervisor. The algorithms provide a faster and more consistently correct means of arriving at the 3D structure.

The algorithms were co-developed with Professor Marcus Brubaker of York University and the research included a collaboration with Professor John Rubinstein of U of T.

“We hope this will allow discoveries to happen at a groundbreaking pace,” says Punjani. “The ultimate hope is that it will lead directly to new drugs — and a much deeper understanding of how life works at the atomic level.”
APP FOR ABSENT DANCERS

Choreography and technology come together in StageKeep, a wearable app that is being developed by two U of T Scarborough alumni, Axel Villamil (BSc, 2017) and William Mak (BSc, 2015).

Villamil first had the idea while dancing with a UTSC group, SC SWAG. Students sometimes had to arrive late for rehearsals, making it “hard to visualize where we were going.”

StageKeep will help. It will calculate the size of a performance space, number of dancers, time between beats, and how much space and time each dancer has to complete a move. The need for rehearsal time could drop by 50 per cent.

A bracelet developed by Villamil and Mak will track a dancer or choreographer performing a base routine, then track how other dancers match it. It will calculate dancers’ accuracy, track their improvement over time and highlight problem areas.

Performers have told Villamil that they welcome this statistical feedback — rather than relying only on people’s opinions. He hopes the app will reduce subjectivity in the hiring and training of dancers.

The pair, who developed their business plan with help from The Hub, hope to eventually tailor StageKeep to other performing arts — how actors move across a stage, for example, or how a car moves on a film set.

BAD HIRING PROCESS CAN LEAD TO BAD REPUTATION

Few people actually like applying for jobs. But Julie McCarthy’s new research shows that organizations need to care about the applicant’s experience.

The U of T Scarborough management professor has co-authored a review study with colleagues in the U.S. and U.K. She says standardized tests — now the norm in many organizations — can be valuable tools when properly conducted. But how applicants react to the test process is important.

“There’s strong evidence that if people feel the process is unfair, biased, or causes anxiety, it can lead to negative reactions towards the organization,” says McCarthy. “Even if they accept the job they may be more likely to quit. It can even have an effect on job performance.”

And it goes further yet. The study indicates that if applicants have a negative experience, they’ll be less likely to buy that company’s products in future — even if they enjoyed them before.

“This is particularly problematic for large corporations that receive hundreds or even thousands of applications a day,” says McCarthy. “A poorly conceived application process could affect their bottom line.”
SAMPLING THE AIR OF REMOTE VOLCANOES

David McLagan’s research takes him to some interesting places — for example, a geothermal field in New Zealand called Craters of the Moon, barren and unearthly with endless steam vents dotting the landscape.

But the U of T Scarborough PhD student says his trip to an active volcano (also in New Zealand) tops the list. He wore a mask to avoid passing out from noxious vapours, and walked with a prodder to check for soft spots that could burn the feet.

McLagan was there to check for mercury, which can last in the atmosphere for around a year, can travel great distances and is linked to a host of brain and nervous system disorders. He deployed a series of air samplers that he is developing under the supervision of chemistry professor Frank Wania and environmental science professor Carl Mitchell.

McLagan’s air samplers are passive, using a carbon material and the natural movements of air. This is crucial in remote locations with no electricity and no access to tanks of argon gas, which active air samplers need.

Air sampling for mercury is common in affluent countries, says McLagan, but fewer than 10 remote sites in the Southern Hemisphere are currently doing it. His ultimate goal is to help resolve this imbalance. “Being able to go to these places and collaborate with researchers from around the world is just a great professional and personal experience.”

GREAT HEARING, EASILY DISTRACTED

*Ormia ochracea* — a nocturnal yellow fly — has the best directional hearing of any creature. A great model for bio-inspired technology? Yes. But new research has found a complication.

The research was conducted by Andrew Mason, a biology professor at U of T Scarborough and, as lead author, his former PhD student Norman Lee, now a professor at St. Olaf College.

Mason explains that the female *Ormia* uses its exceptional hearing to locate the songs of male crickets, where it deposits its larvae (which eat the cricket alive). Instead of two separate ears, the *Ormia* has two eardrums that are connected. When one vibrates from a sound wave, it pushes the other. The very brief time difference involved lets the fly determine where the sound is coming from.

The flies are tiny, says Mason, “relative to the wavelength of the sound.” They can localize it only because of their coupled eardrums.

Engineers could use the same principle in artificial sensors where size is an issue — e.g., hearing aids. But the study found that *Ormia*’s special hearing system prevents it from using SRM (spatial release from masking), a technique that allows most animals to deal with distracting noises — like tracking one conversation at a crowded party.

Lab tests showed that a distracting noise to one side diverts the *Ormia* away from the all-important cricket sound.

Somehow, says Mason, the fly overcomes this apparent limitation in nature. How? This is an important area for his future research.
Klenk, an environmental science professor at U of T Scarborough, thinks academics’ devotion to scientific method sometimes diminishes the real-world value of their research.

“In climate science, for instance, questions are answered dominantly through quantitative analyses. Research that deals with in-depth experiential knowledge — from, say, fishermen or farmers who are tied to certain space and place — may not be easily aggregated into this.”

She relates an instance where engineers, analyzing the sustainability of Caribbean coffee plantations, didn’t want to incorporate the personal narratives of local growers. They finally did — fortunately, since that information was just as necessary as the objective data about rainfall and yields. Without it, the results would have been useless to the growers.

At the same time, Klenk says non-academic partners can derail a project or damage its credibility.

“The whole point of the scientific method is to show that knowledge works consistently and we can trust it. When you open yourself up to different types of knowledge, does that mean anything goes? That can’t be. But I struggle with who adjudicates those different types of knowledge.”

For academics, she believes it’s sometimes necessary to “let go of power” and sometimes necessary to “reinforce that expert role and try to keep those boundaries clear.”

Nicole Klenk
Environmental Science professor
AI EXPERT RECOGNIZED FOR LIFE’S WORK

Graeme Hirst has won the 2017 Lifetime Achievement Award from the Canadian Artificial Intelligence Association (CAIAC).

A computer science professor at U of T Scarborough, his research includes breakthrough work in detecting Alzheimer’s disease from a person’s writing. His paper on semantic similarity is considered a foundational piece, as is his doctoral dissertation on the automatic resolution of linguistic ambiguity. Also, since 2008, he has edited the Synthesis series of books on human language technologies.

Hirst sits on the executive of the international Association for Computational Linguistics and has also been active in CAIAC, whose newsletter he revamped in the 1980s to create a magazine called Canadian Artificial Intelligence. It was pivotal in bringing researchers together. At a time of rapid advancement in AI, Hirst helped build momentum in Canada.

He says he’s been fortunate. “I finished my undergraduate studies just at the time of the first breakthroughs in computational linguistics. My PhD supervisor, Eugene Charniak, was one of the leaders of the field.”

Hirst has won teaching awards in his 31 years at UTSC, and has supervised students such as Julie Payette, Canada’s second woman in space, and Kathleen Fraser, recent winner of a Governor General’s Gold Medal.

“Fraser’s win is going to be a favourite memory from now on,” he says. “And then there are all the students that didn’t win a Governor General’s Gold Medal — though they probably should have.”

IS THERE ANOTHER EARTH? SCIENTIST ANSWERS A FEW QUESTIONS

“Are we alone?”

Earlier this year, a NASA announcement brought this question to the fore. The discovery of seven Earth-sized planets orbiting a single star has been hailed as an accelerated leap forward in the search for extraterrestrial life.

But what does it all mean, in layperson’s terms? Dan Tamayo, a researcher at U of T’s Centre for Planetary Sciences, answers three key questions:

HOW BIG A DISCOVERY IS THIS?

This is a huge deal, way bigger than previous discoveries. These are all small planets, and we expect there are billions of them in our galaxy. But planets this small are really hard to detect.

Most of the exoplanets [planets orbiting a star other than our sun] that we’ve discovered are bigger and therefore probably more gaseous, like Neptune or Jupiter.

It’s exciting because these planets may have a solid surface capable of hosting biological life.

WILL WE LEARN MORE WHEN THE JAMES WEBB SPACE TELESCOPE (JWST) LAUNCHES IN 2018?

The JWST is right in the sweet spot to observe the atmospheres of these planets. Because they’re so close to Earth, it may be possible to detect whether they have ozone. That wouldn’t be a slam dunk for life, but would make them prime exoplanets to study.

WHAT ELSE WOULD WE LOOK FOR?

Liquid water is essential to life on Earth, so it makes sense to look for life on planets that are not too hot or cold for surface water. Of course, not all life in the universe needs to rely on liquid water. But, pragmatically, it’s a good starting point.
INFRASTRUCTURE SUPPORT
- Greenhouse in the Science Research Building
- Teaching and Research in Analytical Chemical and Environmental Science (TRACES) Lab
- University of Toronto Koffler Scientific Reserve at Jokers Hill
- UTSC Library Finance & Trading Lab
- UTSC Library Makerspace
- UTSC Observatory

RESEARCH CENTRES
- Centre for Biological Chemistry
- Centre for Ethnography
- Centre for the Neurobiology of Stress
- Centre for Planetary Sciences
- Culinaria Research Centre
- Environmental Nuclear Magnetic Resonance Centre
- Integrative Behaviour and Neuroscience Group
- Plant Cellular and Molecular Processes Group
Canada Research Chairs

Canada Research Chair in Integrative Perspectives on Personality 2016-2021
Brian Connelly
Management

Canada Research Chair in Bioelectrochemistry of Proteins 2016-2021
Kagan Kerman
Physical & Environmental Sciences

Canada Research Chair in Spatially Resolved Biochemistry 2016-2021
Bebhinn Treanor
Biological Sciences

Ministry of Research, Innovation and Science

Early Researcher Award 2017
Steven Farber
Human Geography

Early Researcher Award 2017
Artur Izmaylov
Physical & Environmental Sciences

Early Researcher Award 2017
Daniel Roy
Computer & Mathematical Sciences

Alfred P. Sloan Foundation Sloan Research Fellowship 2016
Stefanos Aretakis
Computer & Mathematical Sciences

University of Toronto Scarborough Internal Awards

University of Toronto Scarborough Research Recognition Award 2017
Li Chen
Historical and Cultural Studies

University of Toronto Scarborough Principal’s Research Award 2017
James Donaldson
Physical & Environmental Sciences

University of Toronto Scarborough Research Excellence Faculty Scholar 2017-2020
Jennifer Chun
Sociology

University of Toronto Scarborough Research Excellence Faculty Scholar 2017-2020
Jeffrey Pilcher
Historical and Cultural Studies

University of Toronto Scarborough Research Excellence Faculty Scholar 2017-2020
Myrna Simpson
Physical & Environmental Sciences

Royal Society of Canada

Fellow 2017
Frank Wania
Physical & Environmental Sciences

University of Toronto Scarborough
Principal’s Research Award 2016
Stefanos Aretakis
Computer & Mathematical Sciences

University of Toronto Scarborough
Research Recognition Award 2017
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Sociology

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Research Excellence Faculty Scholar 2017-2020
Jeffrey Pilcher
Historical and Cultural Studies

University of Toronto Scarborough
Research Excellence Faculty Scholar 2017-2020
Myrna Simpson
Physical & Environmental Sciences
U of T Scarborough Undergraduate Research Poster Forum 2016-17
(Sponsored by the Library and the Office of the Vice-Principal Research)

First Place:
Tasneem Ezzy
Psychology

Second Place
Dilakshan Srikanthan, Sumaya Dano, Luke Ajay David, Nimra Javaid, and Amanda Yee
Centre for French and Linguistics

Graduate Student Research Award 2016-17
Sonya Dhillon
Psychology (Master’s student)
David McLagan
Physical & Environmental Sciences (PhD student)

Garimah Shah
Psychology
Monica Shah and Abdulwahab Sidiqi
Centre for French and Linguistics
Janesa Tam
Centre for French and Linguistics

3rd Place
Ayesha Tasneem
Biological Sciences
Steven Chang
Physical & Environmental Sciences
Maegan Evelyn Sweeney
Physical & Environmental Sciences

Graduate Student Travel Grant 2016-17
50 travel grants totaling $18,600
BOOKS PUBLISHED BY U OF T SCARBOROUGH RESEARCH FACULTY IN 2016-17

**HISTORICIZING THE PAN AMERICAN GAMES**
Bruce Kidd
Cesar R. Torres

**THE ANIMAL GAME**
Daniel E. Bender

**READING IN A SECOND LANGUAGE**
Xi Chen
Vedran Dronjic
Rena Helms-Park

**THEORIES OF CONSCIOUSNESS: AN INTRODUCTION AND ASSESSMENT**
William Seager

**DECISION DIAGRAMS FOR OPTIMIZATION**
David Bergman
Andre A. Cire
Willem-Jan van Hoeve
John Hooker

**PHYLOGENIES IN ECOLOGY**
Marc W. Cadotte
T. Jonathan Davies

**CHINESE LAW IN IMPERIAL EYES**
Li Chen

**SISTERS OR STRANGERS?**
Marlene Epp
Franca Iacovetta

**STAGING STRANGERS**
Barry Freeman

**THE AESTHETICS OF EMOTION**
Gerald C. Cupchik

**UNDER THE COVER**
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**UNDER THE COVER**
Clayton Childress
SOCIAL NEUROSCIENCE
Eddie Harmon-Jones
Michael Inzlicht

MARGARET BOURKE-WHITE AND THE DAWN OF APARTHEID
Alex Lichtenstein
Rick Halpern

INSECT HEARING
Gerald S. Pollack
Andrew C. Mason
Arthur N. Popper
Richard R. Fay

SCENESCAPES
Daniel Aaron Silver
Terry Nichols Clark

DOMAINS OF FREEDOM
Thembeka Kepe
Melissa Levin
Bettina von Lieves

THE GARIMA GOSPELS
Judith S. McKenzie
Francis Watson

THE JUDICIAL ROLE IN A DIVERSE FEDERATION
Robert Schertzer

BEAUTY AND THE END OF ART
Sonia Sedivy

THE POLITICS OF INCLUSIVE DEVELOPMENT
Judith A. Teichman

THE DEATH AND LIFE OF THE URBAN COMMONWEALTH
Margaret Kohn

THE ORGANIZATION OF CITIES
John R. Miron

THE CONSOLATIONS OF MORTALITY
Andrew Stark

THE CONSOLATIONS OF MORTALITY
Andrew Stark

THE DEATH AND LIFE OF THE URBAN COMMONWEALTH
Margaret Kohn
Research funding data from the University of Toronto Research Information System award report generated on September 19, 2017, non-prorated, Grant Year April 1, 2016 - March 31, 2017.

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<td>Sorensen, Andre</td>
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<td>Urbanization, Planning and Developmental States in Comparative Historical Perspective</td>
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<td>Tanner, Julian</td>
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<td>Teichroeb, Julie</td>
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<td>The Influence of Resource Quality and Usurpability on Vervet Monkey Foraging Decisions</td>
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<tr>
<td>Teichroeb, Julie</td>
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<td>Understanding the Drivers of Individual and Group-Level Movements in Gregarious Species</td>
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<td>Terebiznik, Mauricio</td>
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<td>Development of Nanobodies Against Salmonella Enterica and Campylobacter Jejuni</td>
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<td>Thiele, Tod</td>
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<td>Dissecting the Structure and Function of Vertebrate Sensorimotor Neural Circuits Using Larval Zebrasfish</td>
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<td>Relations Between Canada and Greece: 1945-1975, Research trip, July 2016</td>
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<td>Trougakos, John</td>
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<td>Why Are We Not Taking Our Breaks? Examining Predictors of Employee Work Break Choices</td>
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<td>Tsuji, Leonard</td>
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<td>Utilizing Indigenous Knowledge and Western Science as Complementary Constructs: The Synchronization of Traditional Harvesting Activities and Agroforestry Community Gardens to Form a Sustainable Import-Substitution</td>
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<td>Subsistence Hunting and Associated Activities of Native North Americans in Remote Communities: Measurement of Indoor Air Quality in Tents as Related to Wood-Smoke Exposure, and the Identification of Potential Health Risks</td>
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<td>Uliaszek, Amanda</td>
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<td>Formation and Evolution of Super-Earths and Sub-Neptune Planets</td>
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<td>Vanlerberghe, Greg</td>
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<td>Alternative Oxidase of Plant Mitochondria</td>
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<td>Vanlerberghe, Greg</td>
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<td>Research Tools &amp; Instruments Grants</td>
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<td>Vanlerberghe, Greg</td>
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<td>Conservation Genetics of the Endangered Queensnake (Regina Septemvittata) in Ontario</td>
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<td>Virag, Balint</td>
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<td>Random Eigenvalues</td>
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<td>Wania, Frank</td>
<td>Department of Physical &amp; Environmental Sciences</td>
<td>Aboriginal Affairs and Northern Development Canada</td>
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<td>Quantifying the Effect of Transient and Permanent Dietary Transitions in the North on Human Exposure to Persistent Organic Pollutants and Mercury</td>
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<td>New Approaches for Predicting and Visualizing Gas/Particle Partitioning of Polycyclic Aromatic Compounds</td>
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<td>Way, Lucan</td>
<td>Department of Political Science</td>
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<td>1917: Culture, Violence and Political Change in the 20th Century, Conference at the University of Toronto</td>
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<td>Weir, Jason</td>
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<td>Weir, Jason</td>
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<td>Welch, Kenneth</td>
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<td>Optimization of Metabolic Flux in the Hummingbird: From Enzymes to Ecology</td>
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<td>Real-Time, Low-Cost, Field-Ready Stable Isotope Analyzer for the Study of Carbon Flux Through the Organism and Ecosystem</td>
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<td>Wells, Mathew</td>
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<td>Dissolved Oxygen Dynamics in Hamilton Harbour</td>
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<td>Evaluating the Linkage Between Circulation and Spatial Water Quality Patterns in the Nearshore of South-Eastern Georgian Bay</td>
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<td>How Metaphysical Dependence Works: A Case Study in Metaphysical Methodology</td>
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<td>Zakzanis, Konstantine</td>
<td>Department of Psychology</td>
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<td>On the Nature of Neurocognitive Dysfunction in Depressive Disorders I Cognitive Impairment Secondary to Depressive Symptomology and Its Relationship with Functional Impairment [S.Dhillon]</td>
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<td>Next Generation Molecular Probes for Magnetic Resonance Sensing and Imaging: Design, Synthesis, Evaluation and Application</td>
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<td>Zhao, Rongmin</td>
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<td>Role of Molecular Chaperone HSP90C in Regulating Arabidopsis Photosynthesis</td>
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</table>
This list includes publications by U of T Scarborough research-stream faculty from January 2016 to June 2017. This is a non-comprehensive list.

**Journal Articles (473)**


Chiu, R.S., Saleh, Y., & Gazzarrini, S. (2016). Inhibition of FUSCA3 degradation at high temperature is dependent on ABA signaling and is regulated by the ABA/GA ratio. Plant Signaling and Behavior, 11(11).


Book Chapters (14)


Freeman, B. (2016). Theatre for a changeable world, or making room for a fire. In B. Freeman and K. Gallagher (Eds.), In defence of theatre: Aesthetic practices and social interventions (pp. 21–34). Toronto, ON: University of Toronto Press.


SELECT PUBLISHED WORKS, 2016-17

**Books (24)**


**Gallagher, K., & Freeman, B.** (Eds.). (2016). *In defence of theatre: Aesthetic practices and social interventions.* Toronto, Canada: University of Toronto Press.


Other: Reviews, Editorials, Notes, Letters, Conference Papers, Short Surveys, Exhibitions, Performances and other (105)


