DEAN’S MESSAGE

DEAN’S ROUND-UP OF 2018

In these pages, you will meet up and coming, as well as established Faculty of Science researchers all doing exciting new and ground-breaking research in their fields. Research that will make life easier, lead to more sustainable methods, deal with the effects of climate change, find better ways to calculate retirement, treat age-related disorders, and create, discover, learn, impact, reach the stars. I hope you enjoy the journey.

Interim Dean EJ Janse van Rensburg

JANUARY
A new series of videos tackling weird and quirky science questions answered by York Science researchers were added to the Faculty’s Do YU Know channel.

The Faculty’s Annual Honours and Awards Ceremony celebrated the outstanding achievements of students and faculty members. Science Communicator in Residence and BBC Environment Correspondent Matt McGrath gave the keynote talk.

FEBRUARY
The Department of Science & Technology Studies hosted the event UX Jobs in the Gaming Industry for graduate students.

MARCH
In partnership with the Fields Institute, the Faculty of Science hosted a sold-out York Science Forum [1] with Nobel Laureate Arthur McDonald. McDonald presented “From the smallest particles to the evolution of the universe: Amazing measurements made 2 km underground,” followed by a panel discussion also featuring Sampa Bhadra and Scott Menary (Physics & Astronomy). The event was moderated by York Science Communicator in Residence Matt McGrath, a BBC environment reporter.

The Faculty’s packed Science Unplugged event featured a presentation by Science Communicator in Residence Matt McGrath [2] and the unveiling of YSciCore.

APRIL
York Science Communicator in Residence Matt McGrath co-hosted a science communication workshop with colleague Alok Jha [3], author and former science correspondent at The Guardian. The sold-out event also included presentations from freelancer Jenny Carpenter, Metro News reporter Genna Buck and The Globe and Mail science correspondent Steven Chen.

MAY
The Faculty of Science hosted another successful Science Rendezvous at the Markham Farmers’ Market.

Sapna Sharma (Biology) received the York University President’s Emerging Research Leadership Award and Laurence Packer (Biology) was elected to the Fellowship of the Royal Entomological Society of London.

JUNE
James Temerty (4) received an honorary degree at the Science & Engineering spring convocation ceremony.

Nantel Bergeron (Mathematics & Statistics) was named a Distinguished Research Professor. Patrick Ingram (Mathematics & Statistics) received the G. de B. Robinson Award from the Canadian Mathematical Society.

JULY
The Allan I Carswell Observatory team hosted Mars Extravaganza July 29 to August 1.

Amanda Chow (Mathematics & Statistics) received a grant from the Canadian Mathematical Society to develop an interactive math space.

AUGUST
Alumni Paul Sanberg (5) received the York-Bryan Alumni Award for Outstanding Contribution.

More than 50 students participated in the 2018 Faculty of Science Summer Undergraduate Research Conference on Aug. 7.

SEPTEMBER
Alumna Pamela O’Doherty (BSc 1982) received the Robert L. Noble Award from the Canadian Cancer Society for her research on the role of the immune system in the development and progression of cancer.

OCTOBER
York Science Communicator in Residence Molly Segal held a workshop, “Anatomy of an Audio Story: How Radio, Journalists and Podcasters Make Stories Out of Science,” and invited guest and CBC Quirks & Quarks producer Sonya Buyting.

Jennifer Chen (Chemistry) was named to the Top 40 Under 40 Power List 2018 by The Analytical Scientist magazine. Sylvie Morin (Chemistry) received an NSERC Engage Grant and Amro Zayed (Biology) was elected as the president of the Entomological Society of Ontario.

NOVEMBER
Grad students and faculty, including Nadia Tsytovik, Amanda Liczner, Laurence Packer and Amro Zayed (all in Biology), from across southern Ontario and beyond were buzzing at the annual BeeCon [6] conference with presentations on bee behaviour, genetics and genomics, conservation and more.

DECEMBER
Thomas Salisbury (Mathematics & Statistics) is named to the Inaugural Class of Fellows of the Canadian Mathematical Society (CMS). The Fellows Program recognizes mathematicians who have made significant contributions to the profession and to the Canadian Mathematical Society.
The search for the origins of the universe received a huge boost in 2018 with the joint appointment of leading researcher and particle physicist Deborah Harris to lead York University’s participation in the Fermilab-hosted Deep Underground Neutrino Experiment (DUNE).

The news heralded the official start of the partnership between York University’s Faculty of Science and Fermilab, an American-based particle physics laboratory.

The Governor General of Canada Julie Payette, an engineer and former astronaut, joined officials from Fermilab and Faculty of Science Dean Ray Jayawardhana at the U.S. Department of Energy’s Fermi National Accelerator Laboratory in Illinois for a tour of the facility.

In her new role, Harris will hold the title of professor at York University while continuing as a senior scientist at Fermilab and a leader in the study of elusive subatomic particles called neutrinos.

She led the construction of the MINERvA neutrino detector at Fermilab and served as co-leader of the experiment’s scientific collaboration since 2010.

As a member of the DUNE team, Harris collaborates with more than 1,000 colleagues from around the world. Together, the international DUNE collaboration will advance research into neutrinos. These tiny particles are the most abundant in the universe, but little understood, although they could answer some of the biggest questions in physics.

“The partnership with Fermilab reflects York’s commitment to world-leading research,” said Jayawardhana. “We are delighted to team up with the international collaboration building LBNF and DUNE, giving our researchers and students frontline opportunities to make significant discoveries on a global scale.”

DUNE, together with the Long-Baseline Neutrino Facility (LBNF), will send the world’s most intense beam of high-energy neutrinos 800 miles through the earth from Fermilab to the world’s most advanced neutrino detector one mile underground at the Sanford Underground Research Facility in South Dakota. LBNF/DUNE, which broke ground last July, will include contributions from scientists and engineers around the globe.

Fermilab Director Nigel Lockyer, a graduate of York University and former director of TRIUMF, Canada’s national laboratory for particle and nuclear physics, said: “DUNE could unlock the mystery of why matter and the universe exist. I’m delighted to be joining forces with the faculty and students from my alma mater to build the world’s most ambitious neutrino experiment.”
STELLAR $3M ENDOWMENT HELPS STUDENTS, COMMUNITY REACH FOR THE STARS AND BEYOND

With a galactic $3-million investment, made in partnership with York University Professor Emeritus Allan Carswell and the Carswell Family Foundation, York University is sharing the wonders of the universe with students, youth in the community and the public through the creation of a new Chair.

The Allan I. Carswell Chair for the Public Understanding of Astronomy in the Faculty of Science, thought to be the first of its kind in North America, is dedicated to science engagement and outreach. It will benefit students and the public through education and activities, involving telescopes at the Allan I. Carswell Observatory, as well as novel technologies such as virtual reality. The endowment will also support the York Science Communicator in Residence program to enhance student-learning opportunities in science communications.

The first holder of the Carswell Chair for a three-year term is University Professor and Senior Lecturer Paul Delaney. Delaney is well known within the University and the broader community for his public outreach and frequent media appearances explaining the mysteries of the universe in a way that everyone can understand.

Working with the Science Communicator in Residence program and the observatory, the Chair will also enhance undergraduate and graduate learning opportunities in science communications. The Chair will be poised to keep pace with emerging technologies, changes in science education, and develop innovative ways to teach, communicate and involve students, as well as the broader community, in the excitement of science.

York University will match the $1.5 million gift from the Carswell Family Foundation for a total of $3 million.

“With this generous gift to the Faculty of Science from Allan Carswell and the Carswell Family Foundation, York University will enhance the exciting educational opportunities in astronomy that we offer our students, while also growing our community outreach initiatives as part of our institutional commitment to public service. Allan’s immense generosity will benefit students, faculty and the public here and across the country, and allow a whole new generation to explore the wonders of our galaxy.”

Rhonda Lenton, president and vice-chancellor at York University

Astronomy.

“The Carswell Chair embodies a truly inspired, exciting and meaningful vision for science engagement – one that is unique in its scope and far-reaching in its impact. Having been drawn to the wonders of space as a kid, I can attest personally to astronomy’s power to stimulate the imagination and instil a passion for science.”

Ray Jayawardhana, dean of the Faculty of Science

LAUNCH OF BIOANALYTICAL CORE FACILITY SERVES RESEARCH COMMUNITY

The Faculty of Science officially launches a new cutting-edge facility named YSciCore, which will provide bioanalytical support to scientists at York University and beyond.

Based in the Life Sciences Building on the Keele Campus, YSciCore offers rapid, high-quality analyses to internal and external clients using state-of-the-art microscopy, nuclear magnetic resonance and mass spectrometry platforms. Technical experts, who can supply critical support from the earliest stages of project design to specialized sample preparation and data analysis, will manage each platform.

The development of YSciCore involved extensive consultations with researchers as well as technical staff led by Professor Derek Wilson in the Department of Chemistry, and key investments by the Faculty of Science to upgrade critical facility equipment.

YSciCore has already attracted interest from local industrial clients including Apotex, Sanofi, Dalton Pharmaceuticals and ImmunoBiochem, among others.

MICROSCOPY AT YSciCore

With microscopy, you can view and capture images of samples that cannot be seen by the unaided eye. Scientists use microscopy to view biological samples like viruses and cells, a variety of large molecules, the characteristics of various surfaces, and more. The microscopy platform of YSciCore includes a FEI Quanta 3D dual beam microscope, a Zeiss Laser Scanning Confocal Microscope and a FEI Laser Scanning Confocal Microscope. The FEI Quanta 3D dual beam microscope provides high resolution imaging performance that can deliver full dynamic characterizations of samples. The Zeiss Laser Scanning Confocal Microscope is used for fast live cell imaging, while the Zeiss Laser Scanning Confocal Microscope is used for high resolution optical sectioning and 3D imaging.

NUCLEAR MAGNETIC RESONANCE AT YSciCore

Nuclear Magnetic Resonance (NMR) spectroscopy is a widely used and essential technique for identifying chemical and biochemical structure, reactivity and molecular behaviour in situ. Similar to the Magnetic Resonance Imaging (MRI) spectrometers commonly used in the healthcare system, NMR combines a magnetic field and low energy radio frequency to investigate samples. The NMR platform at YSciCore includes a 700 MHz NMR spectrometer that allows researchers to investigate the nature of complex biochemical and chemical systems on a molecular level. The instrument is uniquely equipped with enhanced sensitivity to enable the study of very small amounts of material, and it implements the newest methods for data collection.

MASS SPECTROMETRY AT YSciCore

Mass Spectrometers measure the mass of objects, particularly atoms and molecules. They have enabled scientists to decipher the innermost workings of the cell, identify diagnostic blood markers in disease, and develop immunotherapies to combat our deadliest pathogens. The mass spectrometry platform of YSciCore houses some of the most advanced instrumentation available that is helping researchers answer their most complex questions. It includes the high resolution Orbitrap Elite, which provides clients access to state-of-the-art identification and characterization workflows in proteomics, lipidomics and metabolomics with unparalleled mass accuracy and specificity.

“The frontline instruments in YSciCore are already being used by researchers in the Faculty of Science to conduct a wide variety of investigations, ranging from environmental analysis to clinical proteomics. As a more integrated facility with enhanced support, YSciCore will now open up its equipment and expertise to the broader community and enable research intensification at York on an unprecedented scale.”

Ray Jayawardhana, dean of the Faculty of Science
A BRILLIANT MIND

Following the death of Stephen Hawking in March, Hélène Mialet (Science and Technology Studies), who had written about his reliance on technology and people for a decade, spoke to various media outlets about his legacy, his fascination, his brilliance and what his loss meant to her. She wrote a piece that was published in The Atlantic and she was also quoted by several media outlets, including The Globe and Mail, L’Express, Radio Canada, CTV News, and CBC’s “Quirks & Quarks.” The New Yorker and New Scientist, among others, also cited Mialet.

A QUESTION OF ANTIMATTER

The Big Bang theory requires equal amounts of matter and antimatter to have been created at the beginning of time, but there is little antimatter in the universe now. What happened to it is the question that scientists like Scott Menary (Physics & Astronomy) and the ALPHA Collaboration have been trying to answer. They came that much closer with the most precise direct measurement of antimatter ever. Menary spoke to VICE’s Motherboard about the breakthrough.

HIDING IN PLAIN SIGHT

Wendy Taylor (Physics and Astronomy) spoke to CBC’s “Quirks & Quarks” about where the Higgs boson was hiding. It wasn’t the explained, but it needed a particle collider to find it, such as the Large Hadron Collider at the European Organization for Nuclear Research, which could collide billions of protons over a two-year period.

WHAT’S THE BUZZ?

Fifteen new species of the clandestine and sneaky cuckoo bee in the genus Epeolus were found by PhD Candidate Thomas Onuferko (Biology), supervised by Laurence Packer, nine of which were hiding in collections and museums across North America. Onuferko spoke about his findings to BBC journalist Matt McGrath, former York U Science Communicator in Residence, and Science Update, which is produced by AAAS.

STILL BUZZING

By sequencing the genome of the yellow-banded cuckoo bee Amro Zayed (Biology), Clement Kent (Biology) and PhD student Nadia Tsvetkova found that inbreeding and disease are likely culprits in their rapid decline in North America. Zayed spoke to Reuter’s UK about their research, Yahoo News and the Japan Times picked up the story, and The Standard in Hong Kong also ran a piece.

OUTTA THIS WORLD

Paul Delaney (Physics and Astronomy) was on several radio and television shows, and in print media, talking about the Leonid meteor showers event at York, dark matter hurricanes, the alien spacecraft solar sail, gamma ray bursts, the NASA Insight landing, and more including CTV’s Your Morning, AM640, NewChannel, CTV-CFTO, CHML Scott Thompson, Ottawa Citizen, and Newstalk 1010 John Moore’s show.
THREE NEW SCIENCE COMMUNICATORS
IN RESIDENCE COME TO YORK

Following the highly successful launch of its one-of-a-kind York Science Communicator in Residence program in 2017, the Faculty of Science opened a second call for applications. Three impressive science communicators joined the Faculty for the 2019-20 academic year. Molly Segal was here in the fall, while Dan Falk and B.D. Colen are expected in the winter and fall of 2019, respectively.

“Once again, the program attracted high-calibre candidates from all over the world, reinforcing widespread interest and demand for opportunities that promote excellence in science communications and journalism,” said Ray Jayawardhana, dean of science at York University. “We are delighted to continue the program for a second year with three outstanding residents with a diverse range of talents in radio, photography and writing.”

The residents can learn about research as it’s happening at the Faculty of Science in the lab or out in the field with researchers, students and staff. At the same time, researchers are given the opportunity to learn more about how to communicate about their research.

MOLLY SEGAL
“Being curious is at the heart of what I do, so to get the chance to surround myself with people who are fundamentally curious about the world is a treat. It’s an honour to learn more about the research happening at York’s Faculty of Science in such an in-depth way. As a journalist producing science stories for radio and podcasts, I see a link between my work and the communication skills scientists can build to bridge their work to the public.”

Molly Segal, documentary and feature story producer for radio and podcasts, which have aired on many national radio programs, including CBC’s Quirks & Quarks.

B.D. COLEN
“Improving public understanding of, and respect for, the sciences and scientists is literally essential for humankind’s continued survival. I look forward to working with York’s researchers and students to help them find ways to communicate with an increasingly skeptical public.”

B.D. Colen, photographer, author, Pulitzer Prize recipient, and former reporter, editor and columnist for the Newsday and Washington Post.

DAN FALK
“I’m thrilled to have the chance to spend an extended period getting to know York’s Faculty of Science. The need for high-quality, responsible science journalism is greater than ever. During my residency, I’ll be speaking with faculty members from a range of scientific disciplines, searching for compelling stories while broadening my knowledge-base; as well, I’m keen on sharing what I’ve learned about the process of bringing science to the public.”

Dan Falk, award-winning science journalist and author of three popular science books.

EXPLORE ALL OPPORTUNITIES

HONORARY DEGREE RECIPIENT FOR THE FACULTY OF SCIENCE, JAMES TEMERTY, TOLD GRADS — BE BOLD AND DREAM

Speaking from the perspective of someone who has experienced success as a tech entrepreneur, honorary degree recipient James Temerty shared words of wisdom on life and achieving success during his address at York University’s 2018 Spring Convocation ceremony.

Temerty, who has extensive accomplishments in technology, clean energy development and community support, began his career at IBM. He moved from IBM to launch the entrepreneurial portion of his career with the retailer ComputerLand, which he expanded from a store into a world-wide franchise. He later founded Northland Power, which operates wind, solar and thermal electric power facilities and has an enterprise value exceeding $10 billion.

He’s also active in philanthropic activities. He was named a Member of the Order of Canada and was honoured as Canada’s Entrepreneur of the Year in 2010 by Ernst and Young.

“I’m here today to speak to you about some life experiences – intuition, confidence through perseverance, and the power of perseverance in crisis and the nature of opportunity,” said Temerty.

Intuition is the fuel for success and by learning how to inform and acknowledge your intuition, you also set yourself up for confidence, he told graduands. He shared some of his own experience when he left IBM after 15 years to move to ComputerLand. He said that although he came up against many people who thought it was a bad decision, he trusted his own intuition – and it paid off.

“Learn to inform your intuition before you act on it. Develop the confidence to trust your intuition and then work like hell to make it happen,” he said.

When you believe in yourself, he said, you are more likely to stand up and seize the moment and persevere long after self-doubters have given up. He did this when he launched Northland Power and today it is a $10-billion company that has a global presence. “The lesson is to persevere through crisis – be careful of the danger and become socially conscious individuals right here in Toronto,” he said. “Be bold, dream, begin.”
AWARDING EXCELLENCE —
FACULTY AND STUDENTS

SELECT FACULTY AWARDS

FSc Early Career Research Award
Jennifer Chen

FSc Established Research Award
Eric Hessels

FSc Excellence in Graduate Mentorship Award
Mark Bayfield

FSc Excellence in Teaching
Derek Jackson
Patricia Lakin-Thomas

SELECT GRADUATE STUDENT AWARDS

CIHR Doctoral Frederick Banting & Charles Best CGS
Wonsuk Jahng

Dalton Pharma Services/Dr. Douglas Butler Award
Jordan Bentley

Nestmann Scholarship
Jennifer Parat
Alexander Kleinov

NSERC Alexander Graham Bell Canada Graduate Scholarship CGS-D — Doctoral
Alexander Kleinov
Tamari Chikuasseli
Alyssa Murdoch

SSHRC Doctoral Fellowship
Catherine Duchastel
De Montrejou

The Vernon Oliver Stong Graduate Scholarship
Gehrig Carthe
Ekans Fegaras
Brandon Khan
Patrik Perkola
Faroe Sapadi
Andre Williams
Mingfu Wang
Buchra Majjad

PROVOST DISSENTATION SCHOLARSHIP
Anthony Leung
Lina Pinto Garcia

VISTA Graduate Scholarship
Sohrab Salimian
Domenic Au
Gaelle Nsamba Luabaya

SELECT UNDERGRADUATE AWARDS

York University President’s Scholarships
Nicholas Chrobok
Katerina Disimino
Greta Raffoul
Jacob Fine
Teresa Siemarzine
Sophia Eisen
Dayana Davoudi

Alumni Award of Distinction renewed
Julia Rybink
Muzi Li

Dr. Robert Lundell Achievement Award
Sheza Qayyum

Gillian E. Wu Award in Biochemistry
Esther Wolf
Mahakpreet Saini

Governors’ Award of Distinction — John Proctor Scholarship
Laura Fallow

The Orgram Scholarship
Heba Alasali

The Professor Ruth Hill Memorial Award
Nicholas Chrobok
Nadav Gazer
Farzam Poorsoltamomhamadi

The Global Leader of Tomorrow Award for International Students
Oscar Castro
Juji Daeutoda

Proves’ Scholarship
Ala Ahmadi-Yazdi
Carley Amos
Anna Vefugina

Sally Murray Findley Memorial Scholarship
Jiyu Wang

Schulich Leader Scholarship
Rathesh Balendran
Katrina Carver
Nadav Gazer
Kezia Johnson

York Science Scholars Award
Hila Abbar
Annabelle August
Dayana Davoudi
Sophia Eisen
Jacob Fine
Pablo Gonzalez
Hannah Gray
Coral Hilli
Stephanie Lo
Sahib Madarar
Davnest Parmar
SAPNA SHARMA
RECIPIENT OF THE YORK UNIVERSITY PRESIDENT’S EMERGING RESEARCH LEADERSHIP AWARD IN 2018

Sapna Sharma (Biology), a Tier 2 York Research Chair in Global Change Biology, received a 2018 President’s Research Excellence Award for her leadership in understanding the impacts of climate change, invasive species and habitat alteration on lakes.

Her research focuses on predicting the effects of environmental stressors on lakes at broad spatial and temporal scales, and improving the scientific approaches used to generate these predictions.

Sharma is also committed to science outreach through her work with the Royal Canadian Institute for Science and is the founder of a science outreach program for refugee families called SEEDS (Science Enrichment and Educational Development for Syrians & Refugees).

NEW AND RENEWED RESEARCH CHAIRS

CANADA RESEARCH CHAIRS (CRCs)
The Government of Canada announced one new and one renewed CRC in the Faculty of Science. The CRCs were created to attract and retain the best minds and to make Canada one of the world’s top countries in research and development. That brings the total of CRCs in the Faculty to eight:

PROF. STEVEN CONNOR
(Biology)
CRC in Neurophysiology (Tier 2)

PROF. GEORG ZOIDL
(Biology)
CRC in Molecular and Cellular Neuroscience (Tier 1)

YORK RESEARCH CHAIRS (YRCs)
York University’s internal counterpart to the national CRC program recognizes outstanding researchers and is designed to build, support and intensify the world-renowned research already underway. Two faculty members were appointed as YRCs in 2018 for a total of nine in the Faculty of Science:

PROF. HUAIPING ZHU
(Mathematics and Statistics)
YRC in Applied Mathematics (Tier 1)

PROF. DEREK WILSON
(Chemistry)
YRC in Molecular Mechanisms of Disease (Tier 2)

NOTABLE RECOGNITIONS

NANTEL BERGERON
DISTINGUISHED RESEARCH PROFESSOR

Nantel Bergeron (Mathematics and Statistics) received the honour in recognition of his scholarly achievements in research.

Bergeron works in algebraic combinatorics and its applications. He has made substantial contributions in Schubert calculus, combinatorial Hopf algebras and in Coxeter-related combinatorics (descent algebras, peak algebras, polytopes etc.). He studies the structure of algebra, combining algebraic objects and breaking them in various ways to understand how different operations relate to each other.

Bergeron holds a York Research Chair in applied algebra and has been the recipient of several honours and awards such as Fields Institute Fellow (2002), Canada Research Chair in mathematics (2001-11), Premier’s Research Excellence Awards (2000-05) and more. He has also been involved with several professional and government organizations, including as a member of the Strategic Projects Opportunity Review Team (advisory committee to the VPRI York University), a panelist for the National Science Foundation and several positions with the Canadian Mathematical Society.

Bergeron has published more than 80 papers, and 2,000 Google Scholar citations with a h-index of 27. He has supervised 19 PhD students and 23 postdoctoral fellows.

RESEARCH FUNDING FACTS

$14.1 MILLION
TOTAL NEW RESEARCH FUNDING FOR THE FACULTY OF SCIENCE

$6.4 MILLION
NEW FUNDS FROM THE NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL OF CANADA (NSERC)

$1.16 MILLION
NEW FUNDS FROM THE CANADIAN FOUNDATION FOR INNOVATION (CFI) AND THE ONTARIO RESEARCH FOUNDATION (ORF)

$2 MILLION
NEW FUNDS FROM THE CANADIAN INSTITUTES OF HEALTH RESEARCH (CIHR)

$2.2 MILLION
NEW FUNDS FOR CANADA RESEARCH CHAIRS AND EARLY RESEARCHER AWARDS

$1.5 MILLION
NEW FUNDS FROM INDUSTRY
John Charles Polanyi Prize
Chris Caputo (Chemistry) received the John Charles Polanyi Prize for chemistry awarded annually to five early stage researchers representing Ontario’s next generation of innovators.

Canadian Institutes for Health Research
Gary Sweeney (Biology) received $661,725, John McDermott (Biology) received $661,726 and Arturo Orellana (Chemistry) received $573,750 in project grants from the Canadian Institutes for Health Research (CIHR) for their projects:
“Cardioprotective Effects of Adiponectin-Stimulated Autophagy,” “Protein: Protein Networks in Regulation of Cardiomyocyte Gene Expression,” and “Developing small molecules targeting LXRb for the treatment of glucocorticoid induced diabetes.”

NSERC Strategic Partnership Grant
Sergey Krylov (Chemistry) and Ryan Hill (Biology) received $952,217 in NSERC Strategic Partnership Grants for their project, “Technology to Enable Automated Manufacturing of Validated Pharmaceutical Hits.”

Early Researcher Awards
Jean-Paul Paluzzi (Biology) and Ryan Hill (Chemistry) received Early Researcher Awards from the Ontario Ministry of Research, Innovation and Science. In addition, Hill was selected for the Ontario-China Young Scientist Exchange Program.

NSERC Discovery Grants
Twenty-seven researchers in the Faculty of Science received more than $5.2 million in NSERC Discovery Grants to pursue ideas and breakthrough discoveries.

Hoffmann-La Roche
Arturo Orellana (Chemistry) also received a $241,000 grant from Hoffmann-La Roche for sustainable drug manufacturing.
Tom Salisbury (Math and Stats) enjoys a good problem, one that will take him at least half a year to solve. He also likes variety. His work nowadays goes back and forth between theoretical probability puzzles and questions related to sustainable income in retirement. “I work on theoretical, curiosity driven, we simply don’t understand how this kind of random system works, problems. What ideas can we throw at it to try to figure out how it should behave?” says Salisbury. “There is a lot of interest these in days in combining randomness with disorder.”

Materials scientists are dealing with material that has all kinds of variations inside of it. It is difficult to measure or know what will happen if you try to send electrons or oil through some disordered piece of rock. “There is going to be randomness in how it moves, but that randomness is influenced by the disordered nature of the material it’s moving in,” he says. “I’ve been working lately on a set of models called random walk in random environment. The random environment is this disordered geometry in which the randomness is taking place.”

The need for high performing materials in batteries, fuel cells and photo-driven water splitting to produce hydrogen for fuel has generated renewed interest in metal oxides. Sylvie Morin (Chemistry) and her group are trying to figure out the inner workings of these oxide materials using state-of-the-art techniques. This will pave the way for the implementation of future innovations of alternative energy production and storage.

Metal oxides use affordable starting materials and simple preparation methods, which allows the material to be put on a wide range of supports, which further broadens their applicability. “There are very low-cost materials compared to materials currently being used in fuel cell applications for example,” she says. “The material is easily prepared, requiring relatively low temperatures with the result being a physically and chemically stable material. These combined features make for easy manufacturing.”

Many groups have prepared similar materials, but there is little agreement on how and why they work. “It’s quite puzzling because their preparation is not very complicated,” she says. “So, we’re trying to understand how their structure and composition relates to their performance.”

Her approach involves two key studies. First, a detailed study of the material’s surface structure. This is important because these processes, such as water splitting, occur at the surface of the material not inside it. In the second, Morin will work with people of different backgrounds and expertise using X-ray Absorption Fine Structure to study how the components of the oxide material, which contains up to three different metals, are arranged inside of it. This powerful technique allows all the metals in her materials to be studied, providing information about the chemical environment of each one. The plan is to do these measurements at the Canadian Light Source in Saskatchewan this summer.

“Using X-ray Absorption Fine Structure and other surface sensitive methods will allow us to understand these materials more deeply and explain the discrepancies between data reported from independent research teams,” says Morin.
Beauty in Light

Ozzy Mermut (Biophysics) saw the light. Like a switch flicking on inside her brain, she was struck by the beautiful nature of photons — particles and waves that constitute light — and their endless possibilities. As a biophotonic researcher harnessing the power of light, she is developing new techniques for early diagnostics of eye-related disorders, and in particular, unlocking the mysteries of degenerative diseases that come with aging.

Shine light through the eye and it will hit the back of the retina illuminating it and sometimes the presence of undetected disease. “The eye is a beautiful window into the brain and aging. You can see early signs of degeneration from aging in the fine architectural layers of the retina,” says Mermut. “I use photons to literally shed light on biochemical processes and tissue level structure to find out how we can better manage age-related disorders, like cancer, macular degeneration, and immunological and neurological diseases.”

For example, the current treatment for age-related macular degeneration involves thermal burning of the retina, but the method also damages healthy tissue. Mermut believes there are ways to direct lasers to treat ocular diseases more effectively, limiting the damage and preserving healthy vision.

Scientists are now able to see retinal amyloid plaques — similar to those found in the brains of Alzheimer’s patients — using high resolution, chemically sensitive optical imaging techniques. “That may lead to early diagnostics by optically imaging the eye,” Mermut says. “Through the eye, I think we will be able to piece together some of the puzzles of aging.”

Her other passion is delivering medicine to remote places, including to space, by creating photon technologies, miniaturized portable labs, using fiber optics that can also monitor critical biomarkers on the go.

“Shine light through the eye and it will hit the back of the retina illuminating it and sometimes the presence of undetected disease.”

The Challenge of Treating Rare Diseases with Affordable Drugs

Conor Douglas

Genomic technology is resulting in diagnoses of more rare diseases than ever before. While this leads to more treatment options, these are often expensive drugs that are difficult to develop and pay for.

“Prices on these drugs are often expensive for only a few people. As many of these diseases are chronic, it is expensive for patients and insurance providers, costing from $100,000 to $300,000 per patient per year,” says Douglas.

“The second challenge is, how do we make sure that the drugs are working, and that combined with the cost, are a cause for concern and a problem for coverage payers. They want to know what they’re getting for their dollars.”

This is where Douglass’s expertise comes in. Problems such as those facing drug companies, patients with rare diseases, and the health systems that regulate and pay for these drugs, are intertwined with social, political, cultural and historical issues as much as they are health services and economic dilemmas. He collaborates with researchers across disciplines, and with those making the decisions about pharmaceutical coverage to develop policy recommendations. While his current work has focused on pharmaceutical, the interconnections between science, technology and society that are of interest to the Department of Science and Technology Studies relate to a number of issues. Those include security, climate change, migration, challenges with information and communications technologies or food security.

“There is a real opportunity for us to work closely with colleagues across the Faculty,” says Douglas. “These issues don’t take place in a cultural, social, historic and economic vacuum. I strongly believe we have a lot of value to add to projects that take a conventional, biomedical sciences approach. The more research teams can integrate in a meaningful way, the stronger the projects will be.”
USING STORYTELLING TO ENGAGE EVEN THE MOST RELUCTANT STUDENTS

VERA PAVRI

Vera Pavri (NATS/STS) does not just lecture, she tells stories. She weaves her lessons into relatable tales full of characters, themes, mystery, intrigue, and cliffhangers. The reason? She wants the students in her courses, such as NATS 1700 (Computers, Information and Society), NATS 1505 (Understanding Cyberspace) and NATS 1775 (Technology and Civilization) to stay engaged.

“Narrating a scientific discovery or technical invention as if it were a kind of mystery novel often gets students excited about what is coming next and creates a sense of anticipation that helps make the lecture material interesting and memorable,” says Pavri. Or, she might start with a question that may seem counterintuitive. When teaching about internet use and brain change, she asks students why more brain activity is not necessarily better brain activity. “It provides me with the opportunity to unravel the answer for them.”

Story-telling is becoming more popular as professors realize the cognitive benefits for students in areas such as motivation, memory recall, reading comprehension, pattern recognition and knowledge transfer.

Pavri also sees active learning as an important way for students to get more involved, including incorporating class debates on topics relevant to them. “I believe that active learning is a great complement to storytelling,” she says. “Student learning is a far more multi-layered process than I once thought — teaching is not equivalent to learning and learning is not just about absorbing content.”

It’s a big challenge. Most NATS students come into the class apprehensive of having to take a general education requirement in science. But Pavri is determined to show even the most reluctant student that the course will have relevancy to them, and that taking it might just enrich their lives in unexpected ways.

Thomas Baumgartner

The components of cell phones, the battery in a car or fitness watch, the cells in the solar panels all have roots in chemistry. Most people don’t think about the chemists in their lab figuring out how to make their cell phone and its inner workings, for example, ever smaller, more flexible, foldable or transparent.

Nothing would happen without them. That’s fundamental science. The kind Thomas Baumgartner (Chemistry) does. “Basically, we’re providing the basis for next generation technologies in the sustainable energy realm,” he says. Most electronics are metals and silicon-based technology and that’s expensive and unsustainable. “We’re trying to make materials that can be turned into organic electronics.”

Chemistry is the beginning, and there needs to be a constant flow of knowledge. “If the source is not there, people downstream don’t get to fish,” says Baumgartner, Canada Research Chair in Sustainable Organommain Group Materials. “That’s in a metaphorical way how fundamental science works.”

In his lab, they are now experimenting with materials for sustainable applications, such as light harvesting and energy storage. It is what he calls the building blocks of the future. They are looking to create something with the properties of a plastic material, lightweight, flexible and reasonably cheap. Then incorporate an electronic function into it, whether that’s a light-emitting element, a solar cell or a battery.

Currently, they are halfway to developing a more sustainable battery using organic materials, but it’s still five to 10 years away from commercial viability. There is a prototype in his lab that’s charging and discharging its load. It has about 50 per cent of the charge storage capacity of a state-of-the-art lithium ion battery.

Thanks to chemistry, a cell phone may one day be as thin as a piece of foil and just as flexible. Or a solar cell could be comprised of transparent components in the form of paint that gets applied to a window.

“We’re at the tipping point right now of climate change and we really need to change things,” says Baumgartner. He’d like to contribute by creating sustainable technologies. “We can help with this big demand. We need to reduce or eliminate our reliance on fossil fuels, so the next generations still have a planet to live on.”
Researchers at York University have come up with the most precise measurement of the fine structure of helium ever measured. “It’s important because there could be clues to some of the mysteries of physics lurking inside of these measurements, things like dark matter,” says Distinguished Research Professor Eric Hessels (Physics and Astronomy).

Hessels and his graduate students Koskuke Kato and Taylor Skinner worked for eight years on the measurement. They were measuring the energy difference between two different, but closely related orbits of the helium atom, known as the helium fine structure intervals. “If you can measure these intervals in helium, you can determine the strength of the electric force between any two charged particles,” says Hessels. “It measures a very fundamental constant of physics, the fine structure constant, which is important for understanding all electric and magnetic forces.”

Hessels, Kato and Skinner measured the fine structure to nine digits of accuracy. Hessels credits their success in part to the use of a new technique he and a former post-doc, Amar Vutha, developed in his lab a few years earlier – the Frequency Offset Separated Oscillatory Fields (FOSOF) technique. This technique is a modification of the Separated Oscillatory Fields technique that has been around for almost 70 years and won Norman F. Ramsey a Nobel Prize. Hessels believes their modified technique will become an important tool in the field of physics going forward.

“Quite a few people around the world have been trying to measure the fine structure of helium, but no one else was using this technique,” says Hessels, York Research Chair in Atomic Physics. “The FOSOF technique led to a better way to determine the energy difference, and ultimately, a major improvement in precision for helium fine-structure measurements.”

He also recently completed a measurement of the size of a proton and is now turning his attention to measuring the electron electric dipole moment.

HONGMEI ZHU

Out of all the hospitals within commuting distance, how do you know which provides the best non-emergency care? This may not sound like a math problem, but it is. It is a real-world computational modelling problem. It is exactly the kind of problem Hongmei Zhu (Mathematics and Stats) and her team want students in high school to learn how to solve.

Zhu knows many students are bored by what they see as repetitive calculations or consider themselves bad at math. They don’t understand the real-world context or how math is relevant to them. The lament, “What do we need to learn this for?” being all too familiar. However, Zhu and her team of volunteers – professors, graduate students, teachers and even parents – are on a mission to change that.

“We want to help increase math literacy for students from Kindergarten to Grade 12 so they can think critically and solve new real-world challenges innovatively in the future,” says Zhu. “Math is a language and it provides a set of tools. It is not abstract. It’s very relevant and constantly evolving because we need to create more math tools to solve new real-world problems.”

To that end, in 2016 they held the first level of the International Mathematical Modelling Challenge (IMC) at national and international levels for Ontario high school students with four participating teams. By 2018, with the help of a $25,000 NSERC grant, 22 teams participated of which 13 successfully finished, including one from British Columbia. Still it is an uphill battle. Teachers are not familiar with computational modelling and its importance in teaching critical thinking, problem solving, communication skills and teamwork. The IMC provides students with a deeper experience of how mathematics can explain our world and what working with mathematics looks like. Math modelling engages students in mathematical reasoning, creative problem solving and team building.

The York team has also branched out beyond the competition to try to bridge the gap by offering teacher workshops, March Break and summer camps, and a Science Odyssey event focused on fractals. For some students, it has been life changing. After the camps, they have gone on to pursue math biology or applied math at university, surprised by how interesting math can be.
Until recently, the state of the Chemistry 1000 course labs were like walking into a time capsule, badly in need of a modern touch. Students worked in archaic, old-school spaces. “It was like walking into a lab that was set up 50 years ago,” says Derek Jackson (Chemistry). “Not only was it staid, it wasn’t fun.” He wondered how he could better prepare students for their future and do it in an interesting way.

Jackson is passionate about not only teaching, but also providing students with the tools and experiences they need to get the most out of their courses. He lobbied hard and got a redo of the labs. Gone are the irrelevant experiments and endless graph plotting and drawing, and the calculations. With much help from Hovig Kouyoumdjian (Chemistry), Jackson ushered in new equipment, about 50 LabQuest instruments, one for every two to three students, instead of the thermometers they were using until then. The LabQuests do the graphing and calculating. “It may sound counter-intuitive,” says Jackson, “but I want students to spend their time predicting outcomes and analyzing data. That’s where the real benefit comes in.”

Through the technology, they can import their data and the lab tutor can pull that same data up on a TV screen, which allows them to see if an experiment is going wrong before the students hand in their work. The advantage is that the students can understand where they have gone wrong and learn how to do it properly before leaving the lab. In addition, the lab tutor can show every student’s ongoing lab results on the screen simultaneously, which gives them another teaching tool to help explain what is happening or not with the experiments.

Jackson also changed up what experiments students perform. Now they dissolve in acid aluminum foil and magnesium to see which is more reactive, for instance. As one lab director put it – “It’s revolutionary what he did for the labs and students.”

And Jackson has big ideas about organic chemistry labs as well.

RAYMOND KWONG
Metals and metal-containing nanomaterials are indispensable components in our modern daily life and used in electronics, automobiles, cosmetics, chemical processing and even in the health care industry. Traces of these metals end up in aquatic environments, but just how they affect animals is something Raymond Kwong (Biology) is hoping to find out.

In particular, Kwong and his team want to understand how metals and metal nanomaterials are affecting the physiological function and behaviour of early-life stage zebrafish. Knowing this would give him a snapshot of how they are affecting aquatic life in general.

“Canada is one of the world’s leading mining countries, and metal contamination is a pressing issue in many Canadian freshwater ecosystems. While some trace metals are necessary for life, such as zinc, iron, and selenium, animals need only specific amounts,” says Kwong, Canada Research Chair in Environmental Toxicology. “The window of essentiality for most metals is very narrow. Too much or too little and they can cause problems.”

Kwong and his team are interested in understanding how aquatic animals regulate the homeostasis of metals. How do they maintain the amount of metals in their system within this very narrow window? “Nanotechnology is arguably one of the fastest growing sectors in Canada, and there is an urgent need to understand their environmental and biological impacts in aquatic ecosystems,” he says. He hopes to understand whether and how exposure to metal nanomaterials affect neuro-physiological function.

“The ultimate goal is to develop next-generation biomarkers for assessing the effects of environmental contaminants, and to develop more relevant criteria for the protection of aquatic life and biodiversity,” says Kwong.

DEREK JACKSON

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THE SECRETS OF LAKE ICE AND THE EFFECTS OF THE BIG THAW

SAPNA SHARMA

Lake ice can tell a scientist a great deal about what’s happening beneath the surface, but until recently, few researchers have been studying the impacts of ice loss, including Sapna Sharma (Biology). Although most people are aware of melting glaciers, the loss of freshwater lake ice across the planet is a huge indicator of climate change. There are thousands of lakes tucked away in northern climes that are signals of big trouble ahead.

Sharma works on collecting data wherever she can on the climate history of lakes using information on ice seasonality. And whether it’s monks in Japan recording dates of ice freeze for 575 years or a men’s club in northern Ontario, she is all about the big picture. Charging ahead in broad strokes and bringing awareness to the warning signs of what ice, and its loss, is telling us.

It’s working. Other researchers are realizing it’s still a largely untapped area. “Winter limnology has become a hot topic in the last year,” says Sharma, York Research Chair in Global Change Biology. “There’s now a lot of interest in ice and under-ice ecology because winter is warming rapidly in recent decades.”

Her research has shown that as climate warms, the ice on lakes forms later in the season and breaks up sooner. This may be contributing to water temperatures, invasive fishes chasing out indigenous species, and lost revenues from cancelled ice fishing derbies.

One of Sharma’s recent studies with her graduate students looks at the trends, drivers and projections of ice phenology in small lakes in northern Wisconsin, and around Dorset and Kenora in Ontario. Based on the data, they predict that by 2050 there will be 16 to 24 fewer days of ice cover and by 2070, 20 to 30 days less. “We know from earlier research that will mean warmer lakes;” says Sharma. “Will that translate to poorer water quality? We think it will. Our future work will look at what that will mean ecologically. We only have about 12 years, maybe 15, to stabilize our greenhouse gas emissions and curb the impacts of climate change.”

SEVEN EMERGING RESEARCHERS JOIN YORK SCIENCE FELLOWS PROGRAM

The Faculty of Science recruited seven emerging researchers from around the world in 2018 to its York Science Fellows program. Established thanks to a generous grant from Jim and Marilyn Simons, the program offers premier post-doctoral fellowships to talented, early-career scientists to pursue their research in collaboration with outstanding scientists in the Faculty of Science.

THE NEW RECIPIENTS

Colin Bridges (1) is focusing on redox flow batteries (RFBs), a promising energy storage technology for integrating intermittent renewable energy sources into grid-scale applications. Most current RFBs use solutions of heavy metals. Working under the supervision of Thomas Baumgartner (Chemistry), Bridges is exploring how carbon-based electro-active materials could improve the operating voltage and energy density of RFBs.

William Chen’s (2) research is in mathematical logic and set theory with a particular interest in combinatorial questions about singular cardinals. Chen is working with Paul Szeptycki (Mathematics & Statistics) on questions involving density, mutual stationarity, and applications of the singular cardinal theory outside of logic, such as general topology, especially in constructing spaces that satisfy certain covering properties.

Daoberto Conteras (3) is building on data analysis techniques developed during his doctoral research to probe data primarily from the cosmic microwave background (CMB) — light from the early universe — to explore the nature of inflation, dark matter, and dark energy and working with Matthew Johnson (Physics & Astronomy).

John Machacek’s (4) research involves combinatorial mathematics and its applications in algebra, geometry, physics, and computer science. He focuses on some specific areas of mathematics, such as cluster algebras and Hopf algebras, which he has already been collaborating on with Nantel Bergeron (Mathematics & Statistics). He also has an interest in mathematical problems from physics and computer science. He will continue to work under the supervision of Bergeron.

Ramon Miranda-Quintana (5) is working under the supervision of René Fournier (Chemistry) and is focusing on devising methods to understand the behaviour of electrons in molecules and materials that have a complicated electronic structure (i.e. those known as “strongly correlated systems”). Some of these compounds play a vital role in modern chemical research.

Christopher Schafhauser (6) is focusing on the structure and classification of operator algebras; he recently introduced a novel approach to the use of ultrapowers in a classification program for C*-algebras. He was already collaborating with Hijas Farah (Mathematics & Statistics) and continues to expand on his research working under the supervision of Farah and Paul Skoufranis (Mathematics & Statistics).

Jacob Lucero (7) is working with Christopher Lortie (Biology) to investigate the processes and mechanisms that drive patterns of biodiversity in ecosystems. Specifically, he will examine interactions between native plants, invasive plants, and herbivores to understand how biological invasions shape biodiversity at local and regional spatial scales.
In summer 2018, the Faculty of Science hosted its largest cohort of undergraduate research students, 25 of whom were recipients of the Dean’s Undergraduate Research Awards (DURAs), while 20 received NSERC Undergraduate Student Research Awards (NSERC USRAs).

The DURA program launched in 2016 to provide additional research opportunities for high-performing science students. The program quickly grew from six awards in the first summer to 25 last year. It gives students exposure to research and an opportunity to learn new skills.

“It’s very exciting to see our program growing,” says Sylvie Morin, associate dean of research and graduate education. “These awards are a great opportunity to learn more about research in our Faculty.”

DURAs are 16-week research positions (paid, full-time) that allow undergraduate students to work in a York University research group over the summer. Topics of past projects have varied from studying the genetics of cancer to investigating probability models to calculate insurance risk.

“For a number of students this may mark their first opportunity to experience research first-hand, which enables them to make informed decisions about whether they choose to pursue research-based graduate degrees or careers,” said Andrew Dorrin (Biology). “It may also provide students with experience in working in a collaborative team environment and effectively communicating their research and its benefits. The paid DURA awards allow students to gain these experiences without financial burden or worry.”

The research students were invited to the Faculty of Science’s 2018 Undergraduate Research Conference in August to share their work through oral and poster presentations.

“The event is an excellent opportunity for students to present their summer research projects, practice science communication, and meet and learn from other students,” said Jennifer Steeves, associate dean of Research and Graduate Education in the Faculty of Science.

DURAs are supported by funds from the Faculty of Science and donors. Last year, Berna Magnuson and Earle Nestmann committed $100,000 over four years, through a tax-smart gift of stocks, to fund a total of 22 DURAs.

More information about eligibility and the application process for the DURAs is available by visiting science.yorku.ca/DURA.

Outstanding in the Field

Experiential education field courses take biology students outside of the lecture halls and indoor laboratories, sometimes as far away as China, Africa or South America, and are a vital part of today’s university learning. However, financial constraints and part-time jobs mean not all students can participate. To accommodate all students, Dawn Bazely (Biology) and Scott Tarof (Biology), along with Rick Balo (Geography), the support of Biology Chair Robert Tsushima, and field course administrators, including Renata Magalhaes, developed an off-campus field course exclusively for York University students. This ran from 7am to 6pm daily in the summer to allow students to commute to their fieldwork.

That forward thinking saw a group of students literally in a field at the Kortright Conservation Authority in Woodbridge last summer measuring soil infiltration rates, studying goldenticks and marshes, among other things. Faculty in biology and geography teach this environmental science course, Biodiversity and Watershed Management, in alternate years.

“Over the years, we have worked hard to provide field course options that are affordable, accessible and inclusive for all students seeking to experience ecology and environmental science field research,” says Bazely.

There are also opportunities for students to live away from home and to participate in experiential education. The Ontario Universities Program in Field Biology (OUPFB) is a consortium of 15 Ontario universities, including York, that have collaborated for 30 years by sharing places on the field courses offered by different universities. In this way, students at one university have access to 25 to 30 field courses each year at diverse locations with very different travel costs and affordability, yet each offering an authentic field research experience.

What’s next? Bazely, with colleagues from across the consortium, are developing a field course that proposes to take biology students to the annual United Nations Climate Change talks to expose students to the science-policy arena.
THE FOLLOWING ARE THE 2018 FACULTY OF SCIENCE CARSWELL SCHOLARS:

- Richard Bloch, Department of Physics and Astronomy
- Yousif Hassan, Department of Science and Technology Studies
- An Le, Department of Chemistry
- Tansushree Tiwari, Department of Biology
- Guanlin Zhang, Department of Mathematics and Statistics

A new group of graduate students from the Faculty of Science and the Lassonde School of Engineering were inspired to push the limits of their research thanks to The Carswell Family Foundation.

The 11 new Carswell Scholars gave a snapshot of their research at a fall awards celebration at the Bergeron Centre for Engineering Excellence, honouring Professor Emeritus Allan Carswell (Physics and Astronomy) and the Carswell Family Foundation for funding the program. The Carswells were presented with a box of thank you letters, outlining how the opportunity to be a Carswell Scholar made a difference.

The foundation’s $1-million gift in May 2016 created a permanent endowment and expendable fund to establish the Carswell Scholarships for graduate students.

“It is thanks to this thoughtful and generous gift from the Carswell Family Foundation that we are here today to celebrate and demonstrate the impact this gift has had on nurturing the scientific potential of graduate students. Several of our graduate students have been able to explore some deeply pressing scientific questions,” said Interim Dean E.J. Janse van Rensburg.

“This is only possible because of the vision and generosity of Allan and his family.”

BY THE NUMBERS

APPLICATIONS & ENROLMENTS

OF 7,506 UNDERGRADUATE APPLICANTS...
1,117 WERE ENROLLED

2018 TOTAL DEGREES GRANTED

516 UNDERGRADUATE (BA, BSc, BScT)
73 MASTER’S
- 27.4% Mathematics & Statistics
- 32.9% Biology
- 12.3% Chemistry
- 19.2% Physics & Astronomy
- 8.2% Science & Technology Studies

37 PHD
- 21.6% Mathematics & Statistics
- 32.4% Biology
- 16.2% Chemistry
- 16.2% Physics & Astronomy
- 13.5% Science & Technology Studies

ENROLMENTS BY MAJOR/PROGRAM

UNDERGRADUATES
- 57.7% Biology
- 16.9% Mathematics & Statistics
- 12.9% Chemistry
- 4.2% Physics & Astronomy
- 1.5% Environmental Science & Geography
- 4.9% Undeclared
- 1.8% Science & Technology Studies

MASTER’S
- 35.1% Biology
- 35.1% Mathematics & Statistics
- 15.6% Chemistry
- 9.1% Physics & Astronomy
- 5.2% Science & Technology Studies

PHD
- 36.2% Mathematics & Statistics
- 27.1% Biology
- 15.5% Science & Technology Studies
- 11.6% Physics & Astronomy
- 9.7% Chemistry

1 Data reflects statistics for the 2018 calendar year
2 Data reflects statistics as of Nov. 1, 2018

ELEVEN NEW CARSWELL SCHOLARS CELEBRATE AND GIVE THANKS
CELEBRATION OF HIGH SCHOOL STUDENT WINNERS OF BIOPHYSICS CONTEST

The Department of Physics & Astronomy hosted an awards celebration in June for its second edition of the biannual York University Biophysics Contest for high school students. The contest required individual students or groups of up to four people to create a poster that tied a physics concept to an issue in biology or medicine.

Out of 73 entries, there were two first-place awards:


Both students received $1,000, as well as $250 for their school’s science department.

SCIENCE ENGAGEMENT PROGRAM RECEIVES FUNDS TO EXPAND KIDS’ CODING CAMPS!

In February, the Faculty’s Science Engagement Program received $60,000 to expand hands-on coding and digital programming for kids. As a member of Actua, York Science was a recipient of Canada’s federal CanCode funding distributed by the 35-member Canadian STEM outreach organization.

Our Science Engagement Program is designed to inspire children and youth to discover and maintain their passion for STEM. It offers innovative and engaging programs for Grades 3 to 12, including “Code with Kids” camps for kids aged 8 to 13. The new funding is reaching more than four years, the Faculty has worked with Actua and its network to develop and exchange content.

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EVOLUTION OF THE UNIVERSE

At the York Science Forum in March, keynote speaker, particle physicist and Nobel Laureate Arthur McDonald [3], took participants on a journey through the underground Sudbury Neutrino Observatory (SNOLAB) to measure the smallest and most elusive particles in the universe. McDonald also participated in a panel discussion with Faculty of Science Professors and physicists Sampa Bhadra and Scott Menary, moderated by Matt McGrath, BBC journalist and former York science communicator in residence.

A Canadian physicist, McDonald is professor emeritus at Queen’s University and director of the Sudbury Neutrino Observatory (SNOLAB) Collaboration. In 2001, McDonald and his colleagues at SNOLAB discovered that neutrinos change identities, or oscillate from one identity to another — proving that neutrinos have mass. The discovery changed our understanding of the innermost workings of matter and led to McDonald receiving the 2002 Nobel Prize in Physics, which he shared with Japanese physicists Kajita Takasaka and Francis Halzen.

BIRDS AND THE BEES, AND CORNFLOCKS

What do birds, bees, polar bears, primates and even cornflocks have in common?

The importance of biodiversity [2]. In fact, the resilience of our planet and the future of humanity rely on it. It is the reason we have air, food, water and medicines, but it is also vulnerable, and in many cases in crisis around the world. The Faculty held its sixth public lecture series on the topic — Biodiversity Conservation in the Twenty-first Century — in partnership with the University of Toronto Public Library and Ontario Nature.

From the Department of Biology, Laurence Packer spoke about the beauty and importance of bees, while Bridget Stutchbury talked about migratory songbirds. Valerie School of Glendon College looked at primates, conflict and conservation. Gregory Thiemann and Gail Fraser, both from the Faculty of Environmental Studies, spoke about polar bears and the bad reputation of cornflocks, respectively.

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MARS EXTRAVAGANZA

In July, the Allan I. Carswell Observatory team at York University hosted free public viewings of Mars [4] at opposition from the top floor of the Arboratum in William Small Centre, where rows of telescopes were set up. Mars is in “opposition” when it is on the opposite side of the Earth relative to the sun. This makes Mars appear closer and brighter than it has in 15 years, and it will not be this close or bright again until 2035.

The team fielded questions and some visitors tried their luck at imaging Mars with their cell phones through the 40-cm telescope. The Red Planet is especially photogenic during opposition because it is fully illuminated by the sun.

A RENDEZVOUS WITH SCIENCE

York University and Markham Village Business Improvement Area (BIA) once again hosted Science Rendezvous [5], Canada’s largest celebration of science in May. The free family-friendly, all-day festival took science out of the lab and onto the streets. Thirty cities across Canada, including various locations in the GTA, hosted events on the same day. Visitors of all ages had a chance to meet with York University scientists and participate in hands-on activities.

Highlights included stage demonstrations, constellation tattoos, making DNA necklaces, racing cars, playing a water piano, and planting a seed for Mother’s Day.

BETHUNE COLLEGE AND THE FACULTY OF SCIENCE HOST SECOND ANNUAL TRI-SCI TOURNEY

The high school outreach event, Tri-Sci Tourney, once again hosted teams of Grade 11 students from Ontario, mostly in Toronto, but from as far away as Barrie, in February, following the great success of the inaugural event in 2017. Students enjoyed a competition where their science preparation skills were pitted against one another in a friendly format, including a hands-on component designed and delivered by the Let’s Talk Science group we support at York. Short tours and a couple of brief Faculty talks added some spice to the event.

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LEARNING FROM THE BEST

MOHAMMAD NAZARI

As a PhD student in the Department of Chemistry, Faculty of Science, Mohammad Nazari, working under the supervision of Sylvie Morin (Chemistry), had long been interested in working in the chemical industry in Germany to learn how they remain on top in their field. When he found out about the German Academic Service Exchange (DAAD) and the competitive RISE Professional program, Nazari knew he wanted to do an internship in Germany. He attended a DAAD event in Toronto to check out the possibilities. “Through the list of the companies offering internships in Germany by this program, the name of BASF caught my eye as the world’s largest chemical company on this planet,” said Nazari, who applied for a position in the Global Development Automotive Fluids department in BASF, as he already had some personal experience in the field of engine coolants.

Shortly after, he was thrilled to be accepted by BASF as an intern in his department of choice. DAAD, through its competitive RISE Professional program, offers opportunities for science and engineering students from the United States, Canada, Great Britain and Ireland to gain practical, career-building experience in Germany. Nazari soon had several telephone meetings with his manager at BASF, Daniel Wilm, and his BASF mentor Masayuki Hirata, which helped orient him to what he would be working on when he arrived in Germany.

During his internship, Nazari helped research and develop new engine coolant fluids using some of the most automated and updated apparatus. He also got the opportunity to visit four different places inside BASF to learn more about the steam cracker factory, the agricultural research centre, the carbon dioxide factory and the wastewater treatment plant. That experience allowed him to “obtain a broader and more diverse overview regarding how different segments of such a complex company operate,” he said.

This was his second trip to Germany. In 2014, he visited the company WITec to characterize his PhD research materials using a new imaging spectroscopy technique. His doctoral research focuses on the design and characterization of materials that can photodegrade pollutants in water using the sun’s energy to drive the process, specifically the properties of modified titanium dioxide materials. Titanium dioxide is already found in some household products, such as sunscreen, because of its UV absorption qualities.

“I would recommend all graduate students who are eligible to apply for the DAAD, through the RISE Professional program, not to miss this life-changing opportunity,” he said.

FINDING MATHEMATICS, A VISIT TO A PRESTIGIOUS SUMMER SCHOOL FOR WOMEN

GINA FARAJ

Undergraduate student Gina Faraj realized back in elementary school in Honduras that she had an affinity for numbers. Her teacher put her into an affinity for numbers. Her teacher put her into a career. “It was great to be with so many talented women who are interested in math and as excited about it as I am,” said Faraj.

In August 2018, Faraj joined women from across Canada and the northwest part of the United States, most of them in the second or third year of math or a related subject, for a program that introduces women to the possibilities of math as a career. “It was great to be with so many talented women who are interested in math and as excited about it as I am,” said Faraj.

Each of the two weeks featured a mini-course by a different female instructor, group project and field trips to businesses who employ math graduates. “It gave me a look at the kind of math that’s taught in older years, which I’m just starting to learn now.”

What Faraj realized is that there is a lot more she can do with her math degree than she previously thought, such as combining math with cancer modelling or math with finance, but her desire to get a master’s degree, or higher, and teach math at a post-secondary institution is still what she wants to do. The summer school, where she also engaged with and mentored high school students, including doing a scavenger hunt with math riddles, helped her decide on that path.

“It confirmed what I was already thinking about doing,” she says. “Teachers really make or break it for you. I would like to be just like one of my good teachers. I want to give back and make a difference to someone else.”
He got his first break in Africa in the Ivory Coast and he has not looked back, although his company is now run from Toronto. He led Iristel from a small startup to an international telecommunications service provider with domestic infrastructure licenses on three continents — North America, Europe and Africa.

He oversees global and domestic strategies for both Iristel and Ice Wireless to ensure business objectives are in line with telecommunications trending needs guaranteeing continued success in highly competitive markets.

He continues to help shape Canadian telecommunications broadband policy, participating in many public forums, that will significantly impact Canada’s future in rural broadband development and advancement.

His hard work, innovative approaches and tenacity won him several awards and accolades, including being a recipient of Profit Magazine’s Young Entrepreneur Award as the youngest CEO among the Top Profit 100 companies in Canada.

When Selena Kim (MSc ’98) was studying molecular biology at York University, she was immersed in cell signalling research. A couple of decades later, she is now a partner in Gowling WLG’s Toronto office, practising in the areas of patents and intellectual property litigation.

As a graduate student in the lab of André Bédard (Biology), Kim conducted laboratory research using chicken embryo fibroblasts as a model and studying transcriptional regulation and cell signalling. This work and study provided her with a sound technical background in molecular biology. She still relies on this technical background today in her work as an intellectual property lawyer.

“The subject matter that I studied at York, and that I still use today, is not something that you can realistically learn on your own as a practicing lawyer,” says Kim.

Kim and her fellow York colleagues were close, spending a lot of time together in the lab in the Farquharson building — and at the local Tim Horton’s in York Lanes — discussing their research. She still keeps in touch with many of them, and they chose different paths to employ their science backgrounds. Kim’s path was law.

She is certified by the Law Society of Upper Canada as a specialist in intellectual property (patent, trademark, and copyright), and is the first woman to have achieved this designation for patents in the Law Society’s history. Her litigation experience includes work before all levels of court in Canada, involving patents for complex mechanical and chemical inventions. Most recently, she achieved a significant win and a permanent injunction for a patentee at trial involving a patented manufacturing procedure for polymer pipes.

Kim is appreciative of the mentorship she received along the way. She is grateful to Bédard, currently of McMaster University, and other professors at York who made her time here fulfilling and special, including Ronald Pearlman (Biology) and Andrew White (Biology).

In addition to her work as an intellectual property lawyer, she is passionate about promoting women in leadership in the workplace.

Asked what advice she would give students today, Kim encourages them to ask many questions and to be flexible.

With a penchant for disrupting and challenging the status quo, Samer Bishay, president and CEO of Iristel & Ice Wireless, Canada’s leading provider of wireless and wireline IP services, is pushing boundaries.

He went up against the big players in telecommunications when he first started out and created space in the market for his competitive local exchange carrier, Iristel, which he founded in 1999 a year after he received his Honours Bachelor of Science degree from York University’s Space and Communications program.

At the time, he was lead systems engineer in the Canadian Space Agency’s radarsat program, where he increased the performance of its satellite mapping. But, he had bigger, higher dreams.

While pursuing most of his time into building Iristel, he was also pursuing his flying license. As Iristel expanded and grew, Bishay took to the skies. He still uses his small jet plane to ferry himself to business meetings around North America.
Images on the front and back covers are computer generated fractals.

Photos (pages 18-27) by Paola Scattolon