

FACULTY OF SCIENCE  
ANNUAL REVIEW

# Transforming for the Future



# 2021

science



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# A Message from Dean Rui Wang

**In 2021**, with the pandemic continuing into its second year — creating challenges for our work and personal lives — the Faculty of Science rose above these challenges and excelled. This Annual Review is all about celebrating that.

Our researchers opened up their labs and welcomed back their teams for the first time since the pandemic began. They forged ahead with their ongoing contributions to Canada's fight against COVID, publishing many papers to further our understanding of the virus, vaccines, and immunity. Our faculty members continued their work on COVID task forces, held seminars, and undertook important media commentary helping to educate the public.

Our staff, departments, and units made a partial transition back to on-campus and in-person services in the fall, while our instructors pivoted to teach some of their courses and labs in person.

We launched our new Strategic Plan, *Science for the Future*, after extensive consultation with our community. We also established our inaugural Dean's Special Advisory Board — comprised of industry leaders in science and innovation — to provide advice and feedback to our Faculty, and help drive its success. And, we established our Faculty's first Pedagogical Innovation Chair in Science Education to promote pedagogical excellence and innovation and improve the effectiveness of teaching for our students.

The Faculty made crucial strides in enhancing Equity, Diversity and Inclusion (EDI) in our Faculty with diversity-focussed



hires and a new EDI Committee. We created a Dean's Scholarship for Women in Science. And we forged new international partnerships that will create exchange and study abroad opportunities, among many other benefits, for our students, and enhance our global engagement.

You can read all about these initiatives, and much more, in this report.

Last but not least, I applaud every member of our Faculty of Science community — faculty, researchers, staff, students, and our supporters — for their efforts over this past year and for remaining flexible and resilient. I am so proud of what we have achieved, together.

This Annual Review demonstrates our commitment to our students, and our vision to foster discovery, engage community and inspire a better future for us all. I hope you enjoy reading it. On behalf of the Faculty of Science at York University, thank you for your friendship and support as we push the boundaries of discovery, innovation, learning, engagement, and impact.

**Rui Wang**

*Dean, Faculty of Science  
York University*



## By the Numbers

# 169

Faculty members  
(Full-time)

# 100

Staff members

# 20

Undergraduate  
programs

# 9

Graduate programs

# 82

Postdoctoral Fellows  
& Visitors

# 4,296

Undergraduate students  
64% Canadian  
36% International students  
(Includes full-time and  
part-time students)

# 472

Graduate students  
65% Canadian  
35% International  
(Includes full-time and  
part-time students)

# 5

**Departments:**  
Biology, Chemistry,  
Physics & Astronomy,  
Mathematics & Statistics,  
Science & Technology Studies

# 1

**Division:**  
Natural Science

# 25

**Bethune-Affiliated  
Student Clubs**





# \$72.3 million

Total annual budget

# \$14.7 million

Total research funding revenue

# \$1.3 million

Total fundraising amount

Annualized results since the time of the 2020  
Annual Review report (as of April 8, 2022)

# 15

Fellows and College members  
of Royal Society of Canada,  
current and emeriti

# 24

Canada Research Chairs,  
York Research Chairs,  
and Endowed Chairs

# 3

Organized  
Research Units

# 4

Faculty-based research  
facilities and equipment centres:

1 Core Analytical Facility (NMR Spectroscopy,  
Microscopy, and Mass Spectroscopy),  
2 Technical Shops, 1 Science Store

## Our Experts in the News

**Dasantila Golemi-Kotra** (Biology) is a microbiologist who has been sharing her knowledge and expertise across Canada with journalists and media covering COVID-19. On dozens of occasions in 2021, she spoke about COVID-19 transmission and infection, variants, immunity, vaccines and other public health measures with media, including *CBC Radio*, *CTV News*, *Global News*, *Toronto Star* and more. Additionally, she published pieces in *The Conversation* about herd immunity and the need for non-pharmaceutical interventions following the deployment of COVID-19 vaccines (co-authored with Professor **Jianhong Wu**, Mathematics & Statistics), as well as new COVID variants and whether vaccines will be effective against them.



DASANTILA GOLEMI-KOTRA

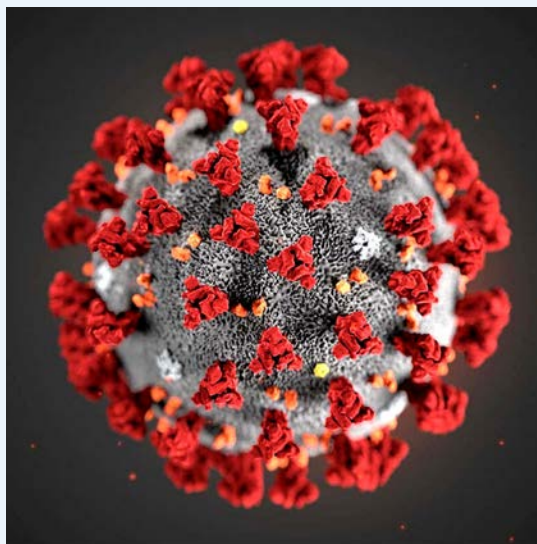
**Jesse Rogerson** (Science & Technology Studies) is a passionate scientist, educator, and communicator in the fields of astronomy and astrophysics. In 2021, he regularly participated in media interviews spanning a wide range of popular space topics like Jeff Bezos' Blue Origin space flight, Inspiration 4 and its all-civilian crew, William Shatner travelling to space, the Perseid meteor shower, the Einstein Ring, the Hubble Space Telescope and more. He appeared on *CP24*, *CTV News*, *CBC Radio* and other radio programs. He also wrote a piece for *The Conversation* about the NASA Mars Ingenuity helicopter flight – a first for space exploration.



JESSE ROGERSON



Some of our researchers in the **Department of Mathematics & Statistics** have been actively focused on the mathematical modelling of COVID-19 transmission, infection, immunity, vaccination and more to inform policy-makers and public health strategies (see page 28 of this report for more details). They have also been sharing their expertise with Canadian and international media since the start of the pandemic. In 2021, COVID-19 projections by the **Centre for Disease Modelling** were referenced in a Toronto Public Health media briefing and featured in a *Toronto Star* story about why Toronto needs to remain in lockdown. Professor **Jane Heffernan** participated in many interviews on topics such as immunity, vaccination, public health measures like masking, outbreaks and waves, and more with *The Globe and Mail*, *CBC Radio*, *Global News*, and *CTV News*, among others. Professor **Jianhong Wu** also spoke to media about masks, new variants, vaccine supply and contact tracing, and Professors **Iain Moyles** and **Jude Kong** were interviewed by *CTV News* and other media outlets about their research on lockdowns and the effect of social media on transmission, respectively.



**Elizabeth Clare** (Biology), who joined the Faculty in summer 2021, develops and applies novel technological approaches to monitor biodiversity, identify species interactions, and assess ecosystem level responses to changes. Most recently she invented a way to extract DNA from air to detect nearby animals – an exciting new opportunity to monitor terrestrial life, particularly elusive animals underground or deep in caves. In 2021, her groundbreaking work was covered by *Science*, *Smithsonian Magazine*, *New Scientist*, *The Guardian* and more.



ELIZABETH CLARE

## Department Chair Highlights

### Biology

“The students, staff, and faculty had marvelous achievements and received tremendous recognition in face of the challenges in 2021. Over 300 Biology undergraduate and graduate students convoked, including 24 MSc and 12 PhD students. Nadia Tsvetkov was the recipient of a York PhD Dissertation Prize. Mohammad Naderi was awarded a prestigious Banting Postdoctoral Fellowship to conduct research with Professor Raymond Kwong.

The department welcomed four new faculty: Ryan Schott, Jade Atallah, Tanya Da Sylva, and Lisa Robertson. Biology faculty were recognized for their research and teaching excellence: Professor

Sandra Rehan was awarded an E.W.R. Steacie Memorial Fellowship for her outstanding research accomplishments, and Professor Tamara Kelly was the recipient of the inaugural Pedagogical Innovation Chair in Science Education to foster and enhance the teaching and learning in the Faculty of Science.

To support the program requirements and sudden cancellation of all summer field courses, Professor Dawn Bazely developed the first virtual field course in Canada in 2020. The tremendous support from the teaching lab technicians, Michael Belanger and Krystina Strickler, allowed 25 York students to complete a summer field course from home. In 2021, the department partnered with the University of Guelph to offer a successful virtual field course to York and Guelph students.”

#### Robert Tsushima

*Chair of the Department of Biology*



ROBERT  
TSUSHIMA

### Physics & Astronomy

“Numerous professors received accolades this year: Saeed Rastgoo received an NSERC Discovery Grant; Sean Tulin was reappointed as a Canada Research Chair, and together with Nassim Bozorgnia launched the EXPLORE program for undergraduate experiential learning through astrophysical research projects; Ozzy Mermut was appointed as York Research Chair in Vision Biophotonics; both Ozzy and Adam Muzzin received tenure and promotion to Associate Professor; both Ozzy and Claire David received grants from the CFI John Evans Leadership Fund; Scott Menary was part of a collaboration whose achievement of the world’s first laser-based manipulation of antimatter made the cover of *Nature*; Distinguished Research Professor Eric Hessels was awarded \$3.36M from the CFI Innovation Fund; and Professor Emeritus Allan Carswell was appointed to the Order of Ontario.

Our students also received recognition: Olga Andriyevska won the Richard Jarrell Excellence in Teaching at the Graduate Level Award; Gehrig Carlse was one of three York recipients of a Governor General’s Gold Medal; and Tarnem Afify won the Faculty of Science Silver Medal.

The Allan I. Carswell Observatory hosted a Mars Perseverance Landing Party, a celebration of Professor Paul Delaney’s retirement, and weekly TeleTube live sky viewing and science talks on YouTube.”

#### Patrick Hall

*Chair of the Department of Physics & Astronomy*



PATRICK HALL



## Science & Technology Studies

“We are happy to report that great progress has been made in reforming the STS minor and major programs in the Faculty of Science. This year, we successfully completed a major modification proposal that was recently passed by the FSc Faculty Council. Along with its major program, STS will soon be offering three new minor options in exciting fields: Life Sciences and Society; Technology, Innovation and Society; and Earth, Sustainability and Society. In addition, two new STS courses were recently approved: Introduction to Science, Technology and Society (STS 1411); and Science, Technology and Racial Social Justice (STS 2333). Our department also voted in favour of our first-ever NATS field-course, Plants in the City, which will start in 2023 and allow students to explore the urban eco-system on York’s campus.

We were also able to have a successful year teaching both in-person and online NATS and STS courses to York students across campus. We appreciate the hard work and dedication of all our

instructors and staff members who have helped these York students successfully complete their degree requirements during these challenging times.”

### Vera Pavri

*Chair of the Department  
of Science & Technology Studies*

### Julie Clark

*Director of the Division  
of Natural Science*



VERA PAVRI



JULIE CLARK

## Mathematics & Statistics

“Our Department welcomed four new faculty members: Jairo Diaz-Rodriguez, Jingyi Cao, Jihyeon (Jessie) Yang, and Assefa Woldegebriel Woldegerima. The Department now has 50 full-time professors, 36 part-time faculty, 28 post-doctoral fellows, four adjunct professors, and many visiting graduate students and professors. Last year, our faculty members contributed to internationally recognized and NSERC-funded research in industrial mathematics, mathematical finance, scientific computing, mathematical biology, disease modeling, vaccine mathematics, actuarial science, data science, biostatistics, statistical machine learning, statistical methodology and theory, algebraic combinatorics, analysis, number theory, probability theory, set theory, and the scholarship of teaching and learning. Many faculty members collaborated with industry and government.

In 2021, the department taught 179 undergraduate courses to 9,000 undergraduate students from across the University (up 20% from the previous year). Some new undergraduate courses were launched, including Introduction to Risk Management and Insurance. 800 undergraduate students majored in our programs (about 40% were international students). The department taught 32 graduate courses to 156 graduate students working towards their MA, MSc, or PhD degree in Mathematics, Statistics, or Industrial and Applied Mathematics.

In 2021, we welcomed two new staff members: Darcelle Taylor and Kari-Ann Noble. The department now has six full-time staff members and one contract staff member.”

### Stephen Watson

*Chair of the Department  
of Mathematics & Statistics*



STEPHEN WATSON

# York Science Highlights

## Department Chair Highlights continued

### Chemistry

“It was another great year for the Chemistry Department. Numerous faculty and students received NSERC funding, scholarships, and international awards. Over 10 new faculty have joined the department in the last five years and that has led to a tremendous increase in research activity, student growth and scope of research projects. Professor Derek Wilson and colleagues received a



MUHAMMAD N. YOUSAF

transformative \$5M research grant. Professor Cora Young received an Early Career Research Award from the Chemical Institute of Canada and appeared along with students in the CBC’s *Nature of Things* to discuss her group’s expertise in air quality during to the pandemic. Professor Chris Caputo was selected as a special delegate for the Science Meets Parliament Program. Professor

Arturo Orellana continues to generate breakthroughs via an academic-industrial collaboration with Hoffman-LaRoche to generate small molecule drugs. Professor

Gino Lavoie’s student Victor Flores received a prestigious CONACYT scholarship from the Mexican Government to fund his doctoral studies.

Colleagues also are innovating teaching. Professor Kyle Belozarov received a grant to pioneer the introduction of Virtual Reality (VR) technology into a biochemistry classroom. In collaboration with Professors Derek Jackson and Philip Johnson, Belozarov designed and delivered a series of VR-based lab exercises in a third-year biochemistry course that helped the students achieve a deeper understanding of biological macromolecules through visualization, measurement, and manipulation of these structures.”

#### **Muhammad N. Yousaf**

*Interim Chair of the Department of Chemistry*



# Community Input Shapes New Strategic Plan

We launched our new 2021-2025 Strategic Plan after extensive consultation with our community of faculty members, staff and students, as well as with internal and external advisory boards.

The Dean's Office hosted discussions with stakeholders through several meetings, including a virtual Town Hall and virtual retreats, and solicited feedback through a virtual suggestion box and a survey. These conversations and tools helped Dean Rui Wang and his Executive Team better understand the current landscape in higher education, the Faculty's performance on the previous Strategic Plan, and what priorities should form the cornerstone of the Faculty's mission and objectives over the next five years. The plan was unanimously endorsed by Faculty Council in spring 2021.

We defined the following priorities:

**Teaching & Learning:** Provide students with a high-quality education and the knowledge, skills, and credentials they desire to successfully transition into rewarding and impactful careers.

**Research:** Foster research excellence through recruitment and retention, recognition, and support of world-class faculty and trainees, combined with a targeted focus on existing and emerging areas of research excellence. Promote impactful, research-intensive culture across the Faculty.

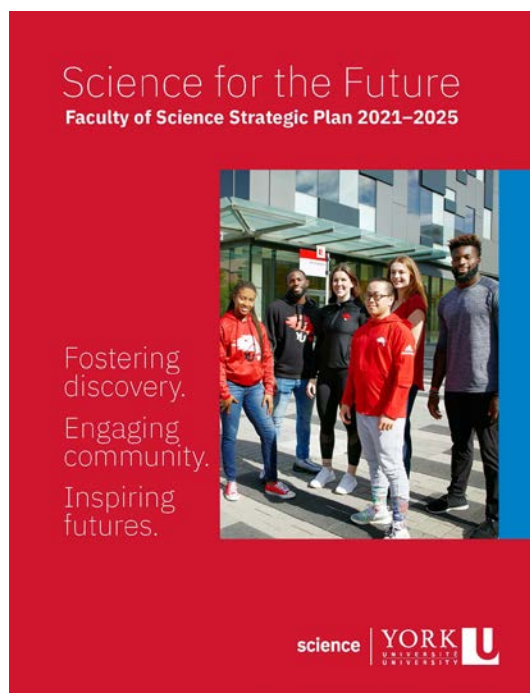
**Student Experience & Success:** Using a student-focused lens, provide supports that enhance our students' experience in the Faculty and facilitate their success during their time with us and beyond.

**Organizational Excellence:** Make the Faculty an enabling, empowering, and inclusive community that attracts and retains high-quality faculty, staff, researchers, and students. Encourage and promote individual excellence as well as collaboration and teamwork.

**Reputation, Engagement & Outreach:** Promote the Faculty effectively to key audiences both within and outside of York University. Offer innovative outreach programs that raise the profile, reputation, and impact of the Faculty of Science.

The Dean's Office continues to consult with the community about how best to implement the Strategic Plan to ensure success in meeting the goals. An implementation workshop was held in fall 2021 with input from dozens of members, and more initiatives will be planned to ensure active participation in the plan.

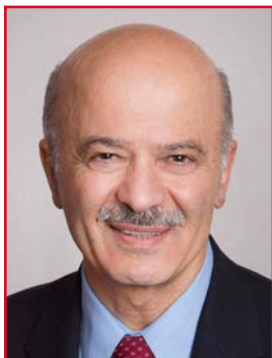
*More details can be found at [yorku.ca/science/strategic-plan/](https://yorku.ca/science/strategic-plan/)*



## New Advisory Board Strengthens Collaborations, Drives Success

We launched our inaugural **Dean's Special Advisory Board** in February 2021 to strengthen collaboration with industry and community, and accelerate the success of our students and faculty. The launch included a virtual public event introducing board members to faculty, staff, students and alumni. The list of members can be found at [yorku.ca/science/advisory-board/](https://yorku.ca/science/advisory-board/).

Comprised of a diverse group of industry and community leaders, the Board brings a vast array of expertise and commitment to the advancement of Canada's science, technology, academic and non-profit sectors. Its members provide insight on pressing issues, including the societal need for science programs, best practices surrounding Equity, Diversity, and Inclusion in science education, challenges and opportunities for science innovation and entrepreneurship, and the successful community integration of the Faculty.



REZA MORIDI

*"The board will provide insight and advice from its diverse expertise to help accelerate the Faculty of Science's success and its connections with industry and our science and innovation sectors in Ontario. The importance of collaboration between higher education and these sectors cannot be underestimated. When educational institutions, industry and community work together, we all stand to benefit. I hope this collaborative model will become standard sector-wide."*

Board Chair **Reza Moridi**, former Ontario Minister of Research, Innovation and Science and Minister of Training, Colleges and Universities



A SCREEN SHOT OF THE LAUNCH MEETING OF THE FACULTY OF SCIENCE DEAN'S SPECIAL ADVISORY BOARD. DEAN RUI WANG IS PICTURED CENTRE FRONT. THE MEETING TOOK PLACE ON ZOOM.



# Science Programs Coming to New Markham Campus

**With the York University Markham Campus opening in fall 2023**, the Faculty of Science has been busy developing programming that will cater to one of the most diverse and dynamic urban communities in the province and country.

In addition to a Professional Master's of Biotechnology Management and Graduate Diploma in Biotechnology – which are still undergoing approval processes at the time of this report's publication – the Faculty of Science will offer first-year foundational science programming in Biology, Chemistry, Math, and Physics. The First-Year Science Program will be the same science courses currently offered at the Keele Campus and share identical course learning outcomes and laboratory experiences. It will follow a phased intake approach, accepting 48 students in the inaugural year and doubling enrolment each year until a full capacity of about 200 is reached in year 2026.

“Science students will have the opportunity to complete their entire first-year experience at Markham Campus if they choose,” said Dean Rui Wang. “The smaller campus environment, with state-of-the-art teaching and learning spaces, will make the new campus a coveted learning space for some of our students.”

Specialized laboratory facilities will include 120 squared metres of space designated for each of the Biology, Chemistry and Physics labs. The campus will also feature multiple lecture and active learning environment areas, as well as numerous common spaces for informal student gatherings and independent study.

Plans for the new programming at Markham Campus include hiring four full-time teaching stream faculty in the Departments

of Biology, Mathematics & Statistics, Physics & Astronomy, and Chemistry. In 2021, Professors **Jade Atallah** (Biology) and **Jihyeon (Jessie) Yang** (Mathematics & Statistics) were recruited; Atallah will teach the first-year Biology courses and manage the Professional Master's in Biotechnology Management and the Graduate Diploma in Biotechnology, while Yang will teach the first-year Mathematics courses and help coordinate the first-year program at Markham. The other two faculty members will be hired by 2023, and more will be recruited as enrolment grows.



“With our hiring we will also pay close attention to mentorship, effective teaching and curricula skills to ensure the faculty complement has the depth and breadth necessary to deliver an innovative and effective program at Markham,” said **Mark Bayfield**, Biology professor and Markham Campus special advisor to the Dean of the Faculty of Science.

*Stay up-to-date on Markham Campus planning at [yorku.ca/markham/](https://yorku.ca/markham/)*

ARCHITECTURAL  
RENDERING OF  
UPCOMING MARKHAM  
CAMPUS

## Building Equity, Diversity and Inclusion in the Faculty of Science

**The Faculty of Science is focused on creating a culture of equity, diversity and inclusion** so that everyone has access to opportunities and can engage and achieve without barriers, and to their fullest potential. That's why one of our goals, as outlined in our 2021-25 Strategic Plan, is to implement principles of equity, diversity and inclusion (EDI) in every aspect of the Faculty of Science community.

"We want to make the Faculty an enticing, enabling, empowering, and inclusive community that attracts and retains high-quality faculty, staff, researchers, and students – one that will encourage and promote individual excellence as well as collaboration and teamwork," said Dean Rui Wang. "In 2021, we made great strides in planting seeds to further enhance and promote EDI among faculty, staff and students and the Faculty as a whole."

The Faculty initiated several targeted faculty searches to strengthen the representation of Black, Indigenous and female faculty members. A search for a Black faculty member in Mathematics & Statistics led to the hiring of Professor **Woldegebreiel Assefa Woldegerima**, whose research interests include mathematical biology, applied differential equations and data analysis in Python. At the time of this report's publication, there were also searches underway for a Black faculty member in pure mathematics, a female faculty member in statistics, an Indigenous faculty member in biology, and an Indigenous faculty member in environmental sciences.

To address the underrepresentation of women in Science, the Faculty launched a Dean's Scholarship for Women to support

domestic female students entering a graduate program in the Faculty of Science who demonstrate leadership skills, academic excellence, and research potential. Four students were selected to receive \$10,000. *See page 40 of this report for more details.*

Faculty of Science postdoc **Don Davies** (Biology) was among four inaugural recipients of York's new Provost's Postdoctoral Fellowships for Black and Indigenous Scholars. His research investigates a novel approach to the causes of Alzheimer's disease (AD) and will include the Canadian Indigenous population, which is at a higher risk of developing AD than the general population. *See page 41 of this report for more details.*

To further our EDI mandate within the Faculty of Science, in 2021 we launched an EDI Committee of Faculty Council, currently co-chaired by Professors **Vera Pavri** (Science & Technology Studies) and **Deborah Harris** (Physics & Astronomy). The Committee supports best practices for recruitment and retention, and strategies to identify and address biases and discrimination. As well, it plans to



WOLDEGEBRIEL  
ASSEFA  
WOLDEGERIMA



# SCIENCE IS FOR EVERYONE

*Creating Cultures of Inclusive Excellence  
in Research and Teaching*



GUEST SPEAKER

**Dr. Imogen Coe**

**Nov 16 | 7 PM | ZOOM**

This talk will address the importance of embedding the principles of equity, diversity and inclusion into academic science in Canada, embracing uncomfortable and sometimes difficult conversations in order to get us to the real work of identifying and removing barriers that limit access and engagement for all.

**Dr. Coe** is a professor of Chemistry and Biology and former founding dean of the Faculty of Science at Ryerson University in Toronto.

PROMOTIONAL GRAPHIC TO ADVERTISE “SCIENCE IS FOR EVERYONE” EVENT TO COMMUNITY

establish new initiatives to bolster EDI, such as support services, training and learning opportunities, content creation and more. For instance, in collaboration with Bethune College, the EDI Committee co-hosted a webinar in November featuring guest speaker Professor Imogen Coe (Ryerson University), who addressed the importance of embedding principles of EDI into academic science in Canada and embracing uncomfortable conversations to identify and remove barriers. She also discussed tips, tools and strategies that can help build the toolkit for change.

“We look forward to continuing to strengthen diversity in our hiring of new faculty members, and furthering our commitment to build EDI and decolonization into all facets of our Faculty of Science community, creating an equitable, safe, and welcoming place for everyone to learn, research and work,” said Dean Wang.

## Expanding Our International Reach and Impact

**With the help of our new International Collaborations and Partnerships team** in the Faculty of Science, led by Hugo Chen, we are extending our reach across the globe to forge new institutional partnerships and collaborations that will benefit our students and faculty members.

In 2021, we established new partnerships that will lead to joint programming, student exchange opportunities, new research collaborations and more. We signed seven new agreements with institutions in China, South Korea and France.

“I truly believe that when students have the opportunity to participate in learning and research abroad, it deepens their knowledge and further develops their skills, leads to new friendships and collaborations, and encourages personal and professional growth that propels their success during their studies and after graduation,” said Dean Wang. “The same benefits can be argued for faculty members and researchers.”

We also created new awards and scholarships for international students coming to York Science. For instance, the Science

Summer Transition Program (SSTP) Award is presented to up to 10 international students who have completed at least two modules of the SSTP and are enrolled in the Science undergraduate programs. The Faculty handed out three awards in 2021. The SSTP was launched in 2020 to help incoming students feel more confident about starting university, regardless of what school they attend. We also established a new International Student Entrance Scholarship for international students from NOIC Academy (Toronto).

Furthermore, we created the Global Leaders of York Science (GLYS), a volunteer team that works closely with the International Collaborations and Partnerships office in supporting international initiatives at York Science. GLYS aims to provide undergraduate students with professional development opportunities that will enhance their employability skills and help them to develop a global mindset. Their activities include a range of internationalization partnership projects throughout the year, including promoting York Science degree programs to potential students from international partners.



SCREEN CAPTURE OF VIRTUAL SIGNING CEREMONY WITH YORK UNIVERSITY AND ULSAN NATIONAL INSTITUTE OF SCIENCE AND TECHNOLOGY (UNIST), SOUTH KOREA.

LEFT TO RIGHT, TOP TO BOTTOM:  
UNIST PARTNERS, LISA PHILLIPS,  
RUI WANG, PATRICK HALL, LUKE LI,  
STEPHEN WATSON, MUHAMMAD YOUSAF,  
HUGO CHEN, HELEN BALDERAMA

# New Pedagogical Innovation Chair in Science Education

In spring 2021, the Faculty of Science announced the inaugural call for applications for the Pedagogical Innovation Chair in Science Education. The Chair would support the mission of the Faculty to promote pedagogical excellence and provide support to a full-time, continuing faculty member to lead pedagogical innovation, which could include developing and adopting new pedagogy methods and technologies into practice, improving the effectiveness of classroom teaching, and measuring the success of these endeavours.

By summer, it was announced with great pride that Professor **Tamara Kelly** (Biology) was appointed to the position, effective September 1, 2021.

“The Faculty of Science has an outstanding culture of pedagogical innovation, led by talented faculty members and instructors who are dedicated to students and their success. Dr. Kelly exemplifies this student-first mindset,” said Dean Rui Wang. “Teaching and learning are the cornerstone of our students’ success and our Faculty as

a whole. I have every confidence that Dr. Kelly will be an outstanding asset in this new role.”

In her role as Chair, Kelly will support the celebration and recognition of pedagogical excellence within the Faculty and lead pedagogical innovation efforts in science education. She will spearhead pedagogical innovation using evidence-based and inclusive strategies, and work with faculty to provide students with exceptional learning opportunities and improved experiences.

Kelly joined York University’s Department of Biology in 2008. She is a longstanding leader in pedagogical scholarship, and has earned a reputation as an expert teacher, mentor, collaborator, and advocate for innovation and improvement to undergraduate education. Her expertise has been recognized with numerous teaching awards, invited talks, and publications. She has a proven history of innovating teaching practices in her own courses and has consistently introduced and promoted evidence-based best practices in science education.

She has worked to promote evidence-based pedagogy through the Faculty’s Committee for Teaching and Learning, developed science education initiatives within the Faculty, and is a co-founder and past president of the Open Consortium of Undergraduate Biology Educators, a national organization to promote knowledge mobilization in undergraduate biology education. Prior to joining York, she served as the Science Teaching and Learning Fellow for the Carl Wieman Science Education Initiative at the University of British Columbia.



TAMARA KELLY



## Celebrating Paul Delaney as He Leaves “Legacy of Stars”

Professor **Paul Delaney** (Physics & Astronomy) stepped down as Director of the Allan I. Carswell Astronomical Observatory in June, in advance of his retirement at the end of 2021. To celebrate and honour him, the Observatory hosted an online retirement party entitled Astronomy 4D Event: The Director Delaney Disengagement Derby, where observatory staff and faculty answered questions, discussed astronomy, and exchanged stories.

“Professor Delaney exemplifies the values we stand for: service excellence, a student-first mindset and dedication to our community both within and beyond York’s walls,” said Dean Rui Wang. “It is hard to quantify what his work has meant to our Faculty and to York University. His ‘legacy of the stars’ will continue to be felt at York for many years to come.”



PAUL DELANEY

Delaney began his career at York in 1986. Over the past three decades, he became the public face of astronomy at York, teaching undergraduate and graduate students, and helping spread a love for astronomy to the public – including thousands of elementary students.

He played a key role in obtaining a 2017 donation from Emeritus Professor Allan I. Carswell and the Carswell Family Foundation to purchase and install a new one-meter telescope. It is the largest telescope on a Canadian university campus, and the Observatory was renamed the Allan I. Carswell Astronomical Observatory in recognition of this donation.

“It is only through [Professor Delaney’s] efforts in establishing and maintaining the functionality of the telescopes that people such as myself were able to give our astronomy

majors hands-on experience with astronomical instrumentation in our courses, starting in year one,” said Marshall McCall, former chair of the Department of Physics & Astronomy. “The opportunities for hands-on experience, which range from understanding and using modern instrumentation all the way to the processing and analysis of data, are a major reason why we attract so many astronomy and astrophysics majors.”

Delaney’s leadership furthered the York Observatory’s capacity for science outreach to the broader community. Pre-COVID-19, about 5,000 visitors annually attended its public viewings on Wednesday nights. During the pandemic, the Observatory transitioned to a weekly YouTube livestream attended by viewers around the world. These livestreams, held on Wednesday nights, can reach upwards of 15,000 viewers. Many astronomy enthusiasts also tune into the popular “YorkUniverse” radio show hosted by York students and faculty on Monday nights on astronomy.fm online.

In 2018, Delaney was named the inaugural Allan I. Carswell Chair for the Public Understanding of Astronomy, a position he held until his retirement. Delaney’s community engagement and outreach in this role, and through his extensive efforts as a media commentator, helped raise the profile of the Faculty of Science and York University. He was a regular commentator on astronomical events on TV, radio, and in print media for many years.

Delaney was beloved by students for his boundless enthusiasm, ability to communicate complex information in an engaging manner, kindness, and sense of humour. In the words of a former student, “Some people are born to teach, and Paul hits the bullseye.”

# Jonathan Cevallos Receives Service Award from President's Office

**Applauded for his can-do attitude**, careful attention to detail and creative ideas, our Faculty's Facilities Manager, **Jonathan Cevallos**, received the 2021 Phyllis Clark Campus Service Award from York University.

This staff recognition award is presented annually to a non-academic employee of York University who has made exemplary contributions to the operations of either of York's campuses in terms of efficiency, cleanliness, safety, security and/or other campus or plant services.

Cevallos' nominators commended him for fully involving himself in the needs of faculty and staff by understanding the scientific needs behind a project to better provide the infrastructure that is needed. "No matter how big or small, he takes the time to figure out exactly what is needed ... he has a great ability to think outside the box and take the project to another scientific level."

As one researcher put it, Cevallos is his front man for dealing and resolving any access, maintenance and repair issues that arise in the lab. "He makes our research more efficient and effective."

Although Cevallos' commitment to service was praised across the board, what stood out most recently to his nominators was how he stepped up during the COVID-19 pandemic to effectively manage building access, security, and safety for researchers, staff and students.

Cevallos played a pivotal role in overseeing the necessary shutdown of research labs and campus access at the start of the pandemic, and when it came time to ramping up research again in 2021, he was highly involved in implementing a smooth, phased approach to ensure safety for everyone.

As one of the nominators explained:

*"One critical aspect of safe return to the lab involved monitoring personnel density in order to ensure the ability to social distance. Mr. Cevallos initiated a unique and important solution by implementing the Shifts application in Microsoft Teams in order to monitor lab personnel presence on campus. Not only did this give individual labs the ability to monitor their research team but it also allowed other labs in the vicinity to know who would be in close proximity. Mr. Cevallos' novel and leading-edge solution has been such an important safety monitoring tool that the VPRI's Research Continuity group asked other Faculties to adopt its use."*

Cevallos' dedication to service continued when the Faculty began preparing for in-person teaching, when he worked closely with course directors and technical staff to assess their needs and coordinate safe operations. What's clear to everyone is that he has been exceeding expectations and enhancing the sense of community within the workplace during COVID-19.



SCREEN CAPTURE OF SURPRISE CONGRATULATORY MEETING TO INFORM JONATHAN CEVALLOS OF HIS AWARD. LEFT TO RIGHT, TOP TO BOTTOM: BRAD SHEELLER, JONATHAN CEVALLOS, JENNIFER STEEVES, PRESIDENT RHONDA LENTON

## External Highlights

Professor **Cora Young** (Chemistry) received the Environment Division Early Career Research Award from the Chemical Institute of Canada. The award recognizes an outstanding early career researcher who has made distinguished contributions in the fields of environmental chemistry or environmental chemical engineering, while working in any sector in Canada. Young is the Rogers Chair in Chemistry at York University. Her research focuses on the development and use of state-of-the-science analytical techniques to probe chemical mechanisms relevant to pollutant fate, air quality (both outdoor and indoor), and climate change.



CORA YOUNG

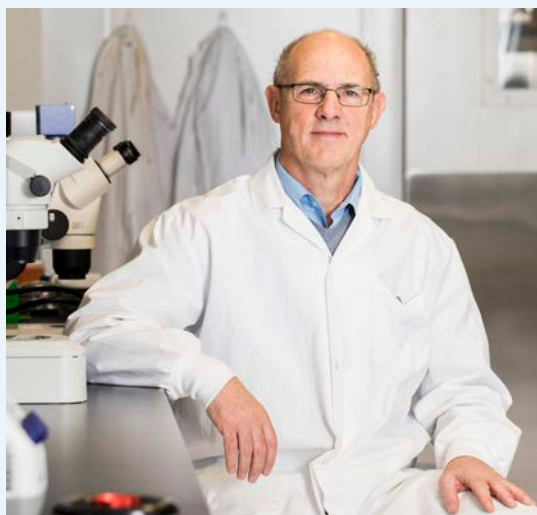


JANE HEFFERNAN

Professor **Jane Heffernan** (Mathematics & Statistics) was elected to the Royal Society of Canada (RSC) College of New Scholars, Artists and Scientists. The College consists of mid-career leaders who provide the RSC with a multigenerational capacity to help Canada and the world address major challenges and seize new opportunities. Heffernan was recognized for her leadership and contributions to infectious disease modelling. She leads her Modelling Infection and Immunity Lab and is the Communications Director for the Centre for Disease Modelling at York University. She works closely with modelling groups in Health Canada, the Public Health Agency of Canada, and the Fields Institute's COVID Modelling Task Force.

Professor **John McDermott** (Biology) was selected as the 2021-2022 York-Massey Fellow at Massey College, University of Toronto. The Fellow position allows privileges at the college and affords the opportunity to contribute to the Massey academic community. McDermott, who holds the McLaughlin Research Chair in the Faculty of Science, studies the mechanisms that cause a simple cell to become more specialized. This work is primarily undertaken using cardiac, skeletal and smooth muscle cells and neurons as model systems, and it is aimed at understanding the role of specialized proteins that bind





JOHN MCDERMOTT

to DNA to orchestrate gene expression. McDermott is particularly interested in studying the basic regulatory mechanisms involved in muscle cellular differentiation.

The **Antihydrogen Laser Physics Apparatus (ALPHA)** collaboration, which includes Professor **Scott Menary** (Physics & Astronomy), was a top 10 finalist in *Physics World's* 2021 Breakthrough of the Year for their demonstration of laser-cooling antihydrogen atoms for the first time. To achieve this, the team developed a new type of laser, which produces 121.6 nm pulses, to cool the antiatoms. They then measured a key electronic transition in antihydrogen with unprecedented precision, a breakthrough that could lead to improved tests of other key properties of antimatter.



SCOTT MENARY



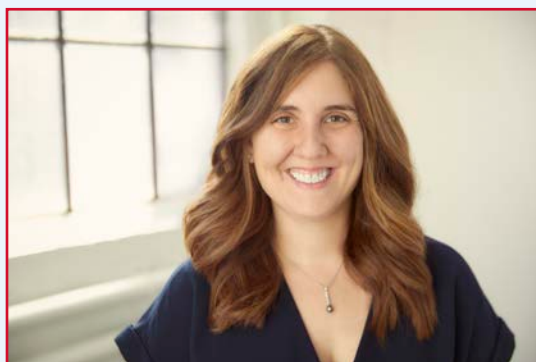
JUDE KONG

Professor **Jude Kong** (Mathematics & Statistics) was identified as one of the Black Heroes of Operational Research by The Operational Research Society. He is an expert in data science, machine learning, infectious disease modelling and population dynamics. His principal research objective is to use mathematical/statistical/computational modelling to study the impact of environmental stressors on species distribution and the dynamics of infectious disease. He is a member of the Fields COVID-19 Modelling Team and the CDC Africa COVID-19 Modelling task force. He is a member of the Canadian Black Scientist Network and the Canadian Center for Disease Modelling, and part of an industrial collaborative network with Sanofi Pasteur. Additionally, Kong leads the Africa-Canada Artificial Intelligence and Data Innovation Consortium.

# Internal Highlights

### Dean's Special Recognition Award

**Ashley Nahornick**, Educational Development Specialist in the Dean's Office, was recognized for her outstanding support of teaching and curricular excellence across the Faculty. Nahornick's efforts have furthered the culture of pedagogical innovation in the Faculty of Science and the development of leading edge, in-demand curriculum that will help us to attract and retain students.



ASHLEY  
NAHORNICK

### Faculty of Science Excellence in Research Awards

#### ESTABLISHED RESEARCHER

Professor **Sapna Sharma** (Biology) received the Established Researcher Award. Sharma's research program is focused on predicting the effects of environmental stressors, such as climate change, invasive



SAPNA SHARMA

species, and habitat alteration, on lakes. She is leading four global synthesis projects with multidisciplinary and diverse research groups involving more than 130 international researchers. At the time of this report's publication, she has published more than 80 scientific articles.



RAYMOND  
KWONG

#### EARLY CAREER RESEARCHER

Professor **Raymond Kwong** (Biology) received the Early Career Researcher Award. Kwong's research seeks to understand the molecular mechanisms that regulate homeostatic function in aquatic animals, and the impacts of environmental stressors on these processes. He holds a Canada Research Chair Tier 2 in Ecotoxicology, and since joining York University in 2016, he has published nearly 20 articles.

#### GRADUATE MENTORSHIP

Professor **Conor Douglas** (Science & Technology Studies) received the Excellence in Graduate Mentorship Award. In his nomination package, Douglas was commended for taking on an active role in the STS Graduate Program and demonstrating excellence in graduate mentorship in the classroom, in supervision, and through his training of Highly Qualified Personnel through his research.



CONOR DOUGLAS

## Faculty of Science Excellence in Teaching Awards

### SENIOR TENURE-STREAM FACULTY

Professor **Dawn Bazely** (Biology) received the Excellence in Teaching Award in the Senior Tenure-Stream Faculty category.



DAWN BAZELEY

*"Throughout all the years I have known her, Dawn has never ceased to consistently amaze me with her tremendous passion for science, students, and their education ... In her research practicum course, she would always ask how*

*I thought about a certain*

*topic and encouraged me to think for myself."*

– STUDENT NOMINATOR

### JUNIOR TENURE-STREAM FACULTY

Professor **Andrew Skelton** (Mathematics & Statistics) received the Excellence in Teaching Award in the Junior Tenure-Stream Faculty category.

*"His understanding of the latest pedagogical methods is remarkable. He not only expresses the wish to help students understand the subject matter more thoroughly, but actively searches and builds on interactive tools and methods for his teaching."*

– STUDENT NOMINATOR



ANDREW SKELTON



TANYA DA SYLVA

### NON-TENURE FACULTY

Professor **Tanya Da Sylva** (Biology) received the Excellence in Teaching Award in the Non-Tenure Faculty category.

*"Professor Da Sylva's class was one of the most inclusive classes I have been at in York. She always encouraged students to put their best foot forward, provided multiple opportunities to engage in discussions with our classmates and fostered student success."* – STUDENT NOMINATOR

### TEACHING ASSISTANTS

PhD students **Jenna LeBlanc** (Biology) and **Laura Keane** (Mathematics & Statistics) received the Richard Jarrell Excellence in Teaching at the Graduate Level Award.

*"Jenna was a great sounding board for ideas about projects and gave good, succinct information in her feedback on assignments. Jenna exhibited her true passion for the classes and care for her students every day that I was in her labs and tutorials."*

– STUDENT NOMINATOR

*"[Laura] built great rapport with her students, creating a comfortable learning environment. It was easy to ask questions, and clarifications were always provided in a respectful and friendly manner."*

– STUDENT NOMINATOR



JENNA LE BLANC



LAURA KEANE



Research Funding

## By the Numbers

# \$14.7 million

Total funding awarded in 2021

## \$6.6 million

Canada Foundation  
for Innovation

## \$4.8 million

Natural Sciences and  
Engineering Research  
Council of Canada

## \$938 thousand

Canadian Institutes  
of Health Research

## \$664 thousand

Government agencies

**\$537**  
thousand  
Other

**\$338**  
thousand  
National Research Council

**\$301**  
thousand  
Industry partners

**\$250**  
thousand  
Fields Institute

**\$170**  
thousand  
Mitacs

**\$25**  
thousand  
Ontario Genomics Institute /  
Genome Canada



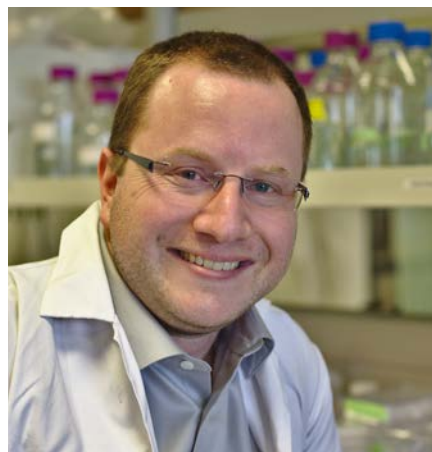
## Highlights

Professor **Eric Hessels** (Physics & Astronomy) was awarded more than \$3.3 million from the Ontario Research Fund, matching an equivalent amount from Canada Foundation for Innovation in 2020, for the project “Tabletop Probe of PeV-scale new physics.” The grant will allow for ultra-precise measurements that will test the fundamental laws of physics at energies that are much higher than the 14-TeV Large Hadron Collider at the European Organization for Nuclear Research (CERN). The infrastructure will be used to test whether the electron is spherical, or whether it has an electric dipole moment – a small distortion in its charge distribution. Such a distortion would be evidence that a fundamental symmetry of physics is violated at high energies, making matter act differently than antimatter.



ERIC HESSELS

Professors **Derek Wilson** and **Sergey Krylov** (Chemistry) were awarded nearly \$2.1 million from the Ontario Research Fund, matching an equivalent amount from Canada Foundation for Innovation in 2020, for the project “Technology-Enhanced Drug Development and Manufacturing (TEnDev): MirrorLab.” TEnDev will enable Canadian international leadership in pre-clinical drug development and manufacturing through the creation of a globally competitive hub for technological innovation in biopharmaceuticals research. The result will be a greatly expanded capacity for biopharmaceuticals research at York University.



DEREK WILSON



SERGEY KRYLOV



Researchers in the **Department of Mathematics & Statistics** received significant government funding for mathematical modelling projects related to infectious diseases and public health, including COVID-19. *See page 28 of this report for more details.*



SANDRA  
REHAN

Professor **Sandra Rehan** (Biology) received the E.W.R. Steacie Memorial Fellowship in recognition of her trailblazing research into the genetics and ecology of wild bees, all to understand how to protect them. The fellowships are awarded to early-stage academic researchers through the Natural Sciences and Engineering Research Council of Canada (NSERC) and come with \$250,000 for research support. The Fellowship will help Rehan expand her research on novel genomic methods to help identify challenges and opportunities to conserve and increase diverse bee populations in cities.

Professor **Jianhong Wu** (Mathematics & Statistics) received a grant from York University's new Catalyzing Interdisciplinary Research Clusters initiative for the project "Disaster and Health Emergency Urban Systemic Risk Transformation Cluster." The funding is valued at \$150,000 per year over three years. The goal of the project is to transform existing thinking, modelling, policy, and practice in urban risk, disaster, and health emergency to create more resilient and healthy cities in Canada and globally.

Professor **Emanuel Rosonina** (Biology) received more than \$800,000 from the Canadian Institutes of Health Research (CIHR) for the project "Regulation of transcription by SUMO." SUMO, short for "small ubiquitin-like modifier," is a protein that modifies many other proteins that have various functions in the cell. Rosonina's work strives to better understand the role of SUMO in controlling gene expression. *See page 35 of this report for more details.*

Ten professors received a total of \$1.38 million in Discovery Grants from NSERC. The recipients included **Hongmei Zhu** (Mathematics & Statistics), **Carol Bucking** (Biology), **Ada Chan** (Mathematics & Statistics), **Steven Connor** (Biology), **Hanna Jankowski** (Mathematics & Statistics), **Christine Le** (Chemistry), **Kevin McGregor** (Mathematics & Statistics), **Pavlos Motakis** (Mathematics & Statistics), **Saeed Rastgoo** (Physics & Astronomy), and **Ryan K Schott** (Biology).

# Using Mathematics to Tackle the Pandemic

**During the COVID-19 pandemic,** mathematical modelling has been an essential tool for researchers and policy advisors to simulate and predict spread and illness by the virus and the impact of various public health strategies and interventions. Our researchers in the Department of Mathematics & Statistics have been leaders in this arena.

## **New funding to lead national disease modelling efforts**

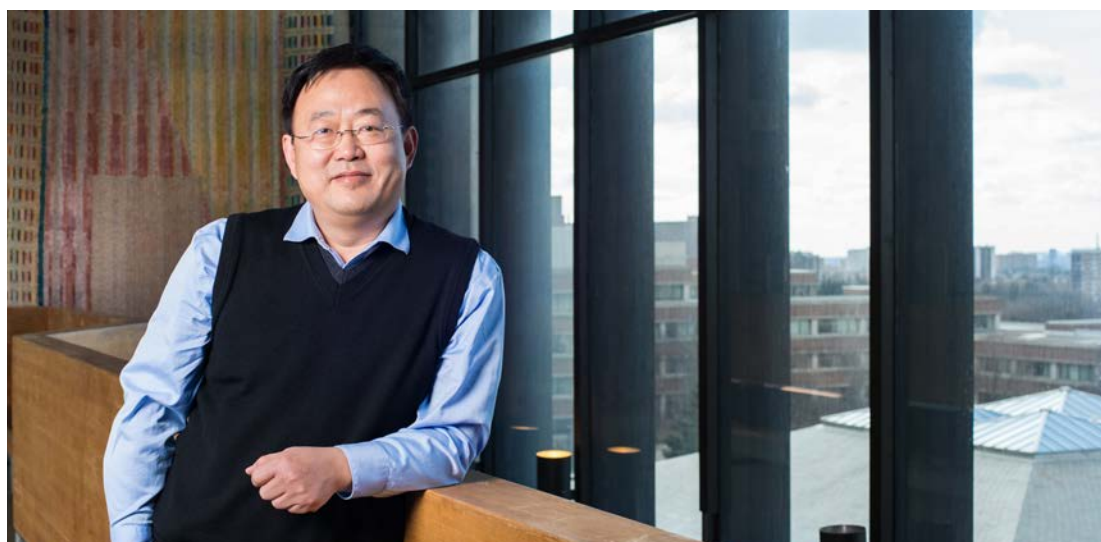
Our researchers received new funding to lead national disease modelling efforts to better predict, prevent, and respond to emerging infectious disease, including COVID-19. The first two projects are among five multidisciplinary infectious disease modelling networks being funded through the Emerging Infectious Diseases Modelling (EIDM) Initiative, by the Public Health Agency of Canada and the Natural Sciences and Engineering Research Council of Canada.

The **One Health Modelling Network for**

**Emerging Infections (OMNI)**, led by Professor **Huaiping Zhu**, received \$2.5 million. The network plays a unique role in the EIDM consortium as the lead in systematically incorporating a One Health approach in its endeavours, by using multidisciplinary knowledge about the connections between environmental, animal, and human health to refine the disease modelling used to identify pathogens early. One Health is incorporated into our thinking, modelling research and training capacity while also recognizing the unique impact emerging infectious diseases has on Indigenous peoples and their communities.

“The OMNI network will focus on developing models and capacity to inform prevention, surveillance and response. We will ‘follow the bug’ from its place of origin to its introduction and establishment,” said Zhu.

The project includes Faculty of Science Professors **Jane Heffernan, Hanna Jankowski, Jude Kong, Iain Moyles, Carly Rozins** and **Hongmei Zhu**.



HUAIPING ZHU



JANE HEFFERNAN



IAIN MOYLES



JIANHONG WU



SEYED MOGHADAS

The project **Mathematics for Public Health** (MfPH), co-led by Professor **Jianhong Wu** (with Professor V. Kumar Murty at the Fields Institute), received \$3 million in funding. MfPH is a collaboration between the Fields Institute, the Atlantic Association for Research in Mathematical Sciences, the Centre de Recherches Mathématiques, and the Pacific Institute for Mathematical Sciences. It forms a national network of infectious disease modellers and public health policy-makers that can rapidly respond to public health emergencies.

“MfPH will accelerate our ability to respond to the current pandemic swiftly and accurately, and prepare for future public health emergencies,” said Wu.

The project includes Faculty of Science Professors **Shengyuan (Michael) Chen**, **Ed Furman**, **Jane Heffernan**, **Jude Kong** and **Seyed Moghadas**.

Additionally, a group of postdoctoral fellows at York (**Leila Amiri**, **Jummy David**, **Martin Grunnill** and **Ao Li**) are coordinating an MfPH Next Generation network for early career scholars, modellers and epidemiologists.

As well, **Heffernan** received a \$200,000 grant from the National Research Council of Canada (NRC) to understand the rate of immunity after vaccination with different vaccine types. The project is part of the NRC’s Pandemic Response Challenge program.

“Different vaccines elicit an immune response using different immune system pathways, which affect the level and type of

immunity you build,” said Heffernan. “With this research, we’re tracking the activation of the immune response that’s been excited by vaccines, looking at the generation of antibodies, as well as memory B cells and T cells.”

To do this, the researchers are combining mathematical models of immunity development with machine learning algorithms. The data will be provided to public health agencies and academic researchers to inform vaccine design and policy, and predict safety and efficacy.

### Data and predictions to inform policy-makers

Our mathematical modellers continued to produce COVID-19 forecasts for public health units and policy-makers locally and internationally in 2021.

The **Laboratory of Mathematical Parallel Systems** (LAMPS, led by Zhu) received funding from the City of Toronto to support predictive modelling for Toronto Public Health. LAMPS and the **Canadian Centre for Disease Modelling** (also led by Zhu) produced weekly forecasts and long-term predictions on COVID-19 that were used to support decision making by Toronto Public Health and other units. The **Laboratory for Industrial and Applied Mathematics** at York, directed by Wu, also produced daily COVID-19 case forecasts for Ontario and all its public health units; the forecasts informed the Ontario COVID-19 Modelling Consensus Table, of which Wu is a member.

**Heffernan** advised modelling activities by Health Canada and the COVID Immunity



Task Force, including modelling health care demand (e.g., ward and ICU beds) and immunity distribution estimations (seroprevalence). She was also asked to participate in many government-informing discussion panels and present her modelling work to groups and government agencies in Canada, USA and Europe. Her work informed decision-makers in public health mitigation programs, vaccine rollout, waning immunity, seroprevalence, and third dose booster programs.

The **Africa-Canada Artificial Intelligence and Data Innovation Consortium** (ACADIC, [acadic.org/](http://acadic.org/)), led by **Kong** and including Wu, continued to provide data insights to inform public health decision making in



Africa, including vaccine roll-out strategies. ACADIC developed online COVID-19 monitoring dashboards that visualize locally relevant information in nine countries: Botswana, Eswatini, Cameroon, Mozambique, Namibia, Nigeria, Rwanda, South Africa and Zimbabwe. The

dashboards are available for anyone to view and are official tools used by policy-makers; more than one million people view the South African dashboard daily, and more than 50 thousand people view the others daily.

Kong and his team also created a novel AI-powered early detection system for South Africa, to alert policymakers to the progression of new infection waves. Additionally, in a research paper Kong assessed social, economic, and environmental factors related to the spread of COVID-19, finding that youth, big cities, social media and income inequality play big roles. The findings are being used to inform policy-makers in Africa about which communities are most vulnerable.

## Using modelling to reveal new insights on the pandemic

Our researchers developed and published new mathematical models that provided estimates and predictions about COVID-19 vaccination, immunity, public health measures and more. In fact, York ranked among the top institutions in Canada for publications on COVID-19 mathematical modeling, with Wu ranking in the top spot.

**Wu** and his team, including Heffernan, published research papers that demonstrated the importance of intensifying testing and contact tracing to prevent future outbreaks and waves, and determined optimal pathways for reopening with different scales and speeds of mass vaccine rollout. His team also evaluated the impact of vaccination in different age groups to achieve herd immunity, and demonstrated the importance of strain-specific interventions to prevent or mitigate outbreaks.

**Moghadas** and his colleagues published articles for The Commonwealth Fund that estimated the impact of vaccination on reducing deaths and hospitalization in the US; the research was covered by *CNN*. He and his team also used mathematical modelling to estimate population immunity in the US, and to find that increasing the interval between two doses of an mRNA COVID-19 vaccine to nine to 15 weeks resulted in superior protection; the latter findings were covered by *Forbes*.

**Moyles** led a study that found that shorter but more frequent lockdowns could lead to fewer infections. The team, which included Heffernan and Kong, developed a novel model that considered individual decisions around the personal cost of complying to social measures. They found that social fatigue and the cost of isolation (e.g., financial, psychological) can diminish the effectiveness of lockdowns and lead to worse health outcomes. The research received media attention by *CTV News* and *Bloomberg*, among other outlets.

# Celebrating New and Renewed Research Chairs



OZZY  
MERMUT

## York Research Chairs (YRC)

Professor **Ozzy Mermut** (Physics & Astronomy) received a new YRC in Vision Biophotonics. Mermut is a biophysicist harnessing the power of light to study human aging. Her group develops diagnostics and therapeutic biophotonics technologies to address age-related degenerative diseases. These techniques translate to accelerated aging studies in the environment of space, to understand long-term health consequences in space. This YRC is for the program Vision: Science to Applications (VISTA), of which Mermut is a core member.

Additionally, the following YRCs were renewed:

- **Nantel Bergeron** (Mathematics & Statistics) – Applied Algebra
- **Chun Peng** (Biology) – Women's Reproductive Health
- **Amro Zayed** (Biology) – Genomics

This brings the total number of YRCs in the Faculty of Science to 11.



SEAN  
TULIN

## Canada Research Chairs (CRC)

Professor **Sean Tulin** (Physics & Astronomy) had his Tier 2 CRC in Particle Physics and Cosmology renewed. His research provides new directions toward discovering dark matter's elusive particle nature. The existence of dark matter is one of the Universe's great mysteries. All stars, planets, and interstellar gas are made from atoms, and yet atomic matter represents only 15 per cent of the total matter in the Universe. The remaining 85 per cent is dark matter. Dark matter provides the cosmic foundation for galaxies to form, but its microphysical properties remain unknown. By combining astrophysics, particle theory, and cosmology, Tulin is developing new ideas to illuminate dark matter's particle dynamics through its effect on cosmic structure.

This brings the total number of CRCs in the Faculty of Science to 10.

## Expanding the Toolbox for Organic Chemists



**CHRISTINE LE** Medicinal compounds containing a fluorine atom have shown to be remarkably effective and potent, making them desirable targets for drug discovery and development. In fact, some of the most widely prescribed medicines contain fluorine, such as the anti-cholesterol drug Lipitor.

“Adding fluorine to a drug molecule can drastically improve its medicinal properties,” said Professor **Christine Le** (Chemistry). “For instance, because of fluorine’s small size and electronegativity, it can block sites of oxidation, which can make a drug more stable.”

Developing new fluorinated compounds is challenging because it often depends on using expensive and highly reactive chemicals that are often incompatible with sensitive drug molecules. Le is looking to

shake things up in this area of chemistry, by developing more efficient, cost-effective and sustainable reactions that create these new molecules. In 2021, she received new funding from the Natural Sciences and Engineering Research Council of Canada, the Canada Foundation for Innovation and Ontario Research Fund, as well as the American Chemical Society Petroleum Research Fund – a highly competitive award that very few Canadians receive – to pursue this line of research.

Her team is using simple and inexpensive fluorine-containing chemicals and figuring out how to transform them into useful medicinal compounds with newly designed catalysts (i.e., substances that increase the rate of a reaction).

“We’re hoping to develop new reactions that expand the ‘toolbox’ that organic chemists can use to stitch chemical bonds and create new molecules in the lab.”

Additionally, the new reactions she develops will aim to be more sustainable, by using more renewable resources and limiting the production of hazardous substances, and more efficient (i.e., requiring fewer steps) – all of which will save time, money and resources down the road if scaled up.

“It takes about 10 years for newly discovered drugs to reach the market; we hope that by making drug discovery and synthesis more efficient, it will lead to more effective, safer and cheaper medicines.”



# Automating Intuition

As a core member of VISTA (Vision: Science to Applications) at York and professor in the Department of Physics & Astronomy, **Joel Zylberberg**'s research lies at the interface of neuroscience and artificial intelligence (AI).

One of his research projects, funded by a Government of Canada New Frontiers in Research Fund, is exploring a new paradigm for machine learning that could “automate intuition” in a sense. The applications of this work are huge: one day AI systems could perform the same function as a radiologist, for example, or any expert that makes complex decisions.

Deep Learning (DL) is where algorithms based on the structure and functioning of the human brain learn from large amounts of data to create patterns for decision making. For example, if you show these algorithms many pictures of handwritten alphabetical letters, they learn to recognize them. But this type of learning has shortcomings.

“Current DL training is different from how students are taught: good teachers share their reasoning, which helps students generalize beyond examples seen in class,” said Zylberberg. “In contrast, DL models often memorize their training data and thus fail to generalize.”

To overcome this failure, Zylberberg is investigating what will happen when he “shows” DL models how humans perform a task, by providing the algorithms with brain activation recordings. His team will have people sit in an fMRI scanner while they do visual tasks (e.g., distinguish between



JOEL ZYLBERBERG

different bird species) and then use these people's brain activation patterns to teach algorithms to duplicate the task expertise. Furthermore, the team will use experts (e.g., active bird watchers) and non-experts to do tasks, going on the hypothesis that using expert brains as a teacher leads to better DL performance.

“Our eventual goal is to apply this to radiology and other domains that require specialized human visual expertise,” he said. “By ‘uploading’ that expertise from the brain into AI algorithms, we could dramatically increase people's access to experts like clinicians.”

Such algorithms could be widely shared with the whole world at a low cost. This work could also be applied to other AI systems.

“At the highest level, our technique will be valuable in automating any task that requires intuition.”

## Hunting for Mysterious Magnetic Monopoles

Using data collected by the world's largest and most powerful particle accelerator – the Large Hadron Collider (LHC) at the European Organization for Nuclear Research (CERN) in Geneva, Switzerland – Professor **Wendy Taylor** (Physics & Astronomy) is on the hunt for magnetic monopoles. She is leading the search as part of the A Toroidal LHC ApparatuS (ATLAS) experiment, an international collaboration of 3,000 physicists from more than 170 universities and laboratories in 38 countries.

“All magnetic objects that have ever been observed have a north pole and a south pole,” said Taylor. “For instance, if you try to break a magnet into its north and south pole, you instead get two magnets, each with a north and a south pole. Some theories predict that particles with only a south or north pole, what we call magnetic monopoles, should exist. But no one has been able to see them yet.”

The elusiveness of magnetic monopoles has puzzled physicists for more than a century. Taylor explains that it makes sense for particles with a fundamental magnetic charge to be present in the universe. And if they do exist, it would explain one of the biggest mysteries in particle physics: why there appears to be a fundamental unit of electric charge (i.e., the electron charge).

Taylor and the ATLAS team designed a specialized technique to search for evidence of magnetic monopoles and have been analyzing data collected from proton-proton collisions at the LHC. They are looking for evidence of large energy deposits that would be left behind by the magnetic monopoles.



WENDY TAYLOR

Their analysis of data collected in 2015-2016 didn't uncover any signs of magnetic monopoles, but now they are looking at a much larger dataset, collected in 2017-2018. Additionally, Taylor and her PhD student **Wen-Yi Song** recently studied the possibility of searching for magnetic monopoles in the collisions of lead ions at the LHC. Their results show that the development of new analysis techniques is required.

# Wrestling to Understand SUMO

Professor **Emanuel Rosonina** (Biology) leads one of a handful of labs worldwide “wrestling” to understand the role of SUMO in controlling gene expression.

SUMO, short for “small ubiquitin-like modifier,” is a protein that modifies (or sumoylates) many other proteins that have various functions in the cell. SUMO’s main targets, however, are proteins that control gene expression.

“Although sumoylation is widespread, targeting thousands of proteins, and increases dramatically when cells encounter environmental stress conditions, it’s not clear what exactly sumoylation does and

why so many proteins are targeted,” said Rosonina. “We also don’t know why some cancers show high levels of sumoylated proteins.”

Using yeast as his model organism, Rosonina’s research has so far shown that sumoylation ensures that proteins interact only with the genes that they’re supposed to control and that these genes can be activated and deactivated efficiently as needed. In 2021 he received a \$830,000 grant from the Canadian Institute of Health Research to continue pursuing this line of work.

With the new funding, he and his team are taking a deeper dive into how SUMO controls the dynamics of protein-DNA interactions to ensure that gene expression is correct. They will identify specific proteins that are targets of sumoylation to characterize how SUMO modification controls their functions at the molecular level. Additionally, they will examine how changes to cellular sumoylation levels affect gene expression by determining which genes are regulated this way and through what mechanisms.

“In the long term, we hope that our work may lead to understanding how dysregulation of SUMO in cancer cells can lead to gene expression patterns that promote tumour growth and formation.”



EMANUEL ROSONINA



# Exposing the ‘Environmentally Friendly’

Many insects, crustaceans and molluscs live in freshwater and play important roles in maintaining the health of the ecosystem. They can be an important food source to other animals like fish and birds, and also help keep water clean by feeding on decaying organic matter and waste.

However, their health and survival are continuously challenged by changes in water chemistry. One of those challenges is salinization, caused by a number of things including road salt used in the winter that then runs off into water.

The impact of salinization on the physiology of freshwater insects and crustaceans is a major research focus in Professor **Andrew Donini**’s (Biology) lab, where he and his students try to understand how these animals deal with salt. They do this by studying the expression and regulation of salt transporters, water transporters and proteins that make up structures that regulate the passage of molecules between cells.

Recently, the team, comprised of PhD graduate **Andrea Durant**, PhD student **Britney Picinic** and Donini wanted to better understand the impact of organic-based deicers, such as beet juice, since these products are being used instead of road salt in some areas without a full understanding of their ecological effects.

“Juice from sugar beets is marketed as environmentally friendly because it reduces the amount of salt used in winter, therefore helping to limit freshwater salinization,” said Donini. “The problem is that there hasn’t



BRITNEY PICINIC, ANDREW DONINI

been any research on how beet juice may affect organisms living in the freshwater habitats that receive runoff; it is just assumed that since we’re using less salt, it’s a good thing.”

In the lab, Donini and his team exposed the crustacean *Hyaella azteca* (which is found in large numbers in the Great Lakes) to different concentrations of salt-contaminated water and a commercial beet juice brine mixture. They found that the beet juice product has detrimental effects on the crustacean, different than those caused by salt alone. The product’s high potassium level seems to cause the insects to lose control of regulating the ion in their blood, which is problematic considering how important potassium is to cell function.

Picinic confirmed, “Our findings reveal that these de-icing products are not as environmentally friendly as we think and they open the door for further research on their impact.”

# Detecting Abrupt Changes in Data

Professor **Yuehua (Amy) Wu** (Mathematics & Statistics) is a researcher who considers interesting statistical problems with her students and models data to come up with analytical tools others can use.

“With statistics, you have to apply,” said Wu. “I train my students to have a good experience with data. We use real data and ask, what is it telling us? We come up with a model with theoretical results.”

One of Wu’s major research interests is change-point analysis. A changing point occurs when there is an abrupt change in the data, where the mechanism of what occurs before and after that point is different. Detecting and analyzing change points can be useful in many different application areas such as tracking stock markets, monitoring medical conditions, detecting climate change, monitoring and assessing the efficacy of the government policies, and more.

“Think of changing point in the context of having a security camera set up around your home,” explained Wu. “One can use changing point analysis to program their system to remove useless footage captures like the movement of squirrels or other animals, and keep more interesting footage of bigger things like people and cars.”

Throughout the COVID-19 pandemic, Wu has continued to work with collaborators virtually and is preparing numerous research papers for publication. Her recent research has focused on applying changing

point analysis to medical imaging. She and her students have developed statistical methods to detect significant changes in images of gastrointestinal bleeds that can also be applied to detect injured lungs. Her methods try to detect meaningful differences in image pixels that indicate abnormalities, which could then be used to automatically alert doctors. The same tools could also be used in other applications such as for quality control, detecting smoke and pollution, and more.

“The idea is for these methods to be packaged as software that can be used by anyone,” added Wu. “People don’t have to fully understand the statistics behind them, they could just go into the software, input their data, and get results automatically.”



YUEHUA (AMY) WU

## Reimagining Online Course Delivery

Professor **Mary Helen Armour** (Division of Natural Science) has always had an interest in trying new things, which led her to explore online teaching long before remote course delivery became a pandemic necessity. Her dissatisfaction with the way it was being done led her to Will Gage, York University's associate vice-president of teaching and learning, and the opportunity to test an innovative online course model.

"Regular classes have benefits, but online teaching always interested me because of accessibility issues," Armour said. "As technology gets better, you can create online courses that offer an equally effective learning experience, but delivered differently, as compared to in-person classes."

Armour, Gage and other educational experts are part of a team that for several years has been developing, testing and refining the "perpetual course model." The model aims to provide students with skills in knowledge

acquisition, knowledge agility, autonomy and professionalism, and interaction and collaboration, while inspiring creativity. Each course's curriculum determines the knowledge they'll need to acquire, but the model offers alternatives in how that information is delivered and assessed to promote the student's mastery of both the subject matter and the aforementioned skills.

Armour was the first faculty member to test this model and it required her to rethink the full-year course "Earth and Its Atmosphere," changing the structure and order of the content. She made it modular and incorporated videos, breaking the four course themes into subtopics. 2021 was her fourth year participating in the perpetual co-model experiment and she has refined her approach and content each year, learning from her experience and student feedback.

"The first year, I made everything due at the end of the course, which was open to students from all years, and the procrastination was horrible," she said. "I realized that they aren't that disciplined, so I reinstated due dates within the themes, but the material was open to students to work on weeks before it was due to allow them scheduling flexibility."

The team now has five courses being taught using the perpetual course model and they meet monthly to discuss and troubleshoot. They are also considering how technology and artificial intelligence can assist the instructors, such as in making the course model responsive to students' learning styles.

The perpetual course model is working towards making high-quality learning opportunities available online in a way that is most beneficial to everyone involved, pandemic or not.

*Adapted from story written by Elaine Smith for York U Innovatus.*



MARY HELEN ARMOUR



# Teaching the Skills to Succeed at University

Having taught high school earlier in his career, Professor **Andrew Skelton** (Mathematics & Statistics) saw firsthand the gaps between a graduating student's experience and the demands of a university education and set out to bridge them.

"There are big changes in study skills, life skills and learning skills and students need to acquire the ability to reflect and adjust," said Skelton.

In the United States, it is quite common to find First-Year Seminar courses, taken for credit by first-semester undergraduates. These courses have a small faculty-student ratio and focus on assisting students to develop practical and intellectual skills that will enhance their university experience. Such courses aren't prevalent in Canada, so Skelton began pondering how a Canadian model might look.

His solution was to develop standalone modules that could easily fit into a first-year course. The models address three types of student needs: mathematical skills (e.g., learning from homework problems), study skills (e.g., avoiding procrastination), and life skills (e.g., managing academic stress).

The project has been three years in the making. The first year was funded by the Junior Faculty Fund in the Faculty of Science. Skelton had three summer students work with him to develop proof of concept. Feedback from the first group of students led Skelton to modify the offerings. The second year was funded by an Academic Innovation Fund grant and was focused on balancing the cost and benefit to the students to create a product they would find valuable.

"I wanted them to be of benefit to students in terms of time and emotional energy and wanted to determine how to advertise them to students and how they would figure into a student's grade," Skelton said. "In doing so, I realized they were built for me and my



ANDREW SKELTON

teaching style and weren't transferable to other professors."

Therefore, the third year of his project (2021), funded by a grant from eCampus Ontario (and the York Science Scholars Award program), Skelton focused on making the modules suitable for use by any faculty member.

"If you, as a faculty member, have an interest in helping the students in your course with these learning skills, I have a product that you can adapt to your teaching style," Skelton said.

Skelton used the modules with 1,200 first-year students in the fall 2021 semester and is currently evaluating the impact they had in the classroom. In early 2022, the modules will be posted online to the eCampus Ontario website, so that they are available to faculty anywhere.

*Adapted from story written by Elaine Smith for York U Innovatus.*

## Inaugural Dean's Scholarship for Women in Science



EMILY ANACLETO



TIBISAY DIAZ



KYRA DOUGHERTY



SUNNA WITHERS

**Launched on the 2021 UN International Day of Women and Girls in Science**, the Dean's Scholarship for Women in Science supports domestic female students entering a graduate program in the Faculty of Science who demonstrate leadership skills, academic excellence, and research potential in the field of science. Four students each received awards of \$10,000.

**Emily Anacleto** is an MSc student working on applications of messenger RNA (mRNA) display for drug discovery. mRNA display is a method of drug discovery where a collection of random DNA sequences is transcribed into mRNA and then translated into a random string of amino acids (or peptide). The peptide remains attached to the mRNA from which it was translated. Thus, when scientists investigate if the peptide binds to a drug target, the attached mRNA can be sequenced as well to learn the identity of peptide. Anacleto's research is focused on developing a novel method of mRNA display to evolve a known weak drug binder into a tighter binder.

**Tibisay Diaz** is a Master's student in the coursework option of the Applied Statistics program. Her primary research interest is in the application of statistical methods to analyze biological data, particularly in the fields of genetics and epidemiology. Previous research experience sparked her interest in disease analysis and modelling, and she expects the skills that

she is developing in her program will allow her to further contribute to the better understanding of human diseases by means of mathematical modelling.

**Kyra Dougherty** is an MSc student studying pokeweed antiviral protein (PAP). PAP damages the genetic code of several different plant and animal viruses and reduces viral levels in cells. The goal of her research is to determine if and where PAP damages the messenger RNA (mRNA) in cells. She will perform computational analyses to identify points of damage, predict common features, and identify if particular patterns or structures of mRNA are preferentially targeted. Achieving viral resistance in crop plants is a potential application of PAP, so understanding the effect of PAP expression in these plants is important.

**Sunna Withers** is an MSc student using simulated observations from the James Webb Space Telescope (JWST) to predict ways to detect early galaxies in the data that will be collected. JWST is the largest and most complex space telescope ever created and is expected to revolutionize our view of the early Universe. One of the many things the JWST will do is observe the most distant galaxies ever detected, which will shed light on the formation and evolution of the first galaxies. Withers' predictions will be applied to the JWST observations to find early galaxies.

# Alzheimer's Researcher Receives Provost's Postdoctoral Fellowship for Black and Indigenous Scholars

Postdoctoral fellow **Don Davies** was among four inaugural recipients of York's new Provost's Postdoctoral Fellowships for Black and Indigenous Scholars. This two-year award, valued at \$70,000 per year, seeks to address underrepresentation in many disciplines and fields by providing Black and Indigenous scholars with the ability to dedicate their time to pursuing new research, while accessing the collegial resources, faculty supervision and mentorship for which York University is well known.

Davies is working in Professor **Steven Connor's** (Biology) lab to investigate a novel approach to the causes of Alzheimer's disease (AD), arguing that processes of forgetting are naturally amplified in major neurodegenerative diseases.

"Despite the passing of more than 20 years since the development of the first transgenic mouse model of AD, our understanding of the underlying mechanisms is surprisingly limited, contributing to a major knowledge gap that has limited development of new therapeutics," said Davies.

One of the strongest genetic predictors for AD outcomes is variation in a gene that encodes apolipoprotein E (APOE), a cholesterol carrier involved with lipid transport and injury repair in the brain. Humans have three different APOE gene polymorphic alleles (E2, E3 and E4); those with one E4 allele are three to four times more likely to develop AD, while those with the E2 allele seem to show resistance to developing AD. Additionally, asymptomatic E4 carriers are at a higher risk of accelerated long-term forgetting (a rapid loss of memory over days or weeks); why this happens is largely unexplored and something Davies

wants to better understand. Using mouse models, he will look at how synapses (the connections between brain cells) are modified in E4 and E2 carriers.

Furthermore, he plans to involve the Canadian Indigenous population, which is at a higher risk of developing AD than the general population and yet chronically understudied when it comes to this disease.

"This opportunity will allow me to establish a research program to study Alzheimer's disease within the Indigenous community and accelerate growth in scholarly diversity through the development of an academic pipeline for Indigenous scientists. I am very grateful for the advice from Dr. Steven Connor, who will be mentoring me during my postdoctoral fellowship."



DON DAVIES



## Stellar First-Year Students Get Feet Wet as Summer Researchers

**Supported by a York Science Scholars Award (YSSA)**, 19 top first-year students participated in their first summer research experience as a university student. The YSSA program provides awards of \$10,000 to high-achieving, passionate science students entering the Faculty of Science. Half of the award is an entrance scholarship and the other half pays for a summer research position following the first year of study. The research opportunity has proven to be a positive experience for everyone involved, supervisors and students alike.

“I consider training them an investment for the future,” said Professor **Sergey Krylov** (Chemistry), who accepted three YSSA students into his lab. “Not only did these students learn a lot, but they also contributed significantly to the research projects. I’d be happy to take new students through this program next summer. I’d be even more happy to have the same students return to the lab and apply their knowledge from their first summer.”

One of the YSSA students in Krylov’s lab was **Ailiya Rizwan**, who went on to receive second prize for her oral presentation at the Faculty’s Summer Research Conference. YSSA recipients **Ethan Sooklal**, **Claire Del Zotto**, and **Elizaveta Yakubovskaya** also swept up half of the awards for poster presentations at the conference.

Sooklal’s summer research focused on using fungus to investigate three major proteins involved in driving the circadian rhythm in eukaryotes.



ETHAN SOOKLAL



ELIZAVETA YAKUBOVSKAYA

“I really enjoyed the process of working on a research project, seeing its progression, gathering the results, and sharing them with my peers at the end of the summer,” said Sooklal. “This experience, above all, strengthened my laboratory techniques and skills.”

His supervisors, Professor **Patricia Lakin-Thomas** (Biology) and PhD student **Rosa Eskandari** also touted the program as an opportunity for the lab to recruit an enthusiastic and highly competent student assistant. In fact, Sooklal was offered the opportunity to continue working with them as a RAY (Research at York) student.

Yakubovskaya was among three YSSA students working with Professor **Andrew Skelton** (Mathematics & Statistics) in summer 2021. Her research project involved creating evidence-based modules to help first-year students build their study skills, specifically time-management.

“I really enjoyed how this research project broadened my understanding of education as a field and as a science,” she said. “Specifically, this project helped me improve my research and science communication skills.”

“I was continually floored by the high calibre of these students and the substantial impact they had on our project,” Skelton said.

# Students are the Stars at Virtual Summer Research Conference

The Faculty of Science hosted its annual **Summer Undergraduate Research Conference** in August 2021, via Zoom, with students from the Faculties of Science, Health, and Environmental and Urban Change participating. The conference was the culmination of participants' summer work terms, where they conducted research in labs across York University.

Most of the participants received a Natural Sciences and Engineering Research Council (NSERC) Undergraduate Student Research Award (URSA), a Dean's Undergraduate Research Award (DURA) or a York Science Scholar Award. The DURAs are funded through Bernadene Magnuson and Earle Nestmann, the Gérard Herbert Award and the Luise Herzberg Award for Women in Science.

"We would like to thank NSERC and all our generous donors who make this event possible," said Michael Scheid, associate dean of students at the Faculty of Science. "These summer placements give our talented undergraduate students an invaluable opportunity to conduct research they're passionate about in a real-world setting and hone their future career trajectories."

At the conference, 43 students showcased their research through oral and poster presentations, spanning topics such as proving dark matter with gravitational waves, cognitive and visuomotor performance in COVID-19 patients, and tracking changes in permafrost thaw on northern lakes. Judges evaluated oral and poster presentations and selected winners for each category.



CORAL HILLEL

The success of the program and virtual conference was also enabled by the generous contributions of time and talent by faculty members, researchers and staff.

"We are grateful to the supervisors, graduate students, postdoctoral fellows and technicians, as well as our event judges and organizers, who helped make this year's program a success," Scheid said.

## **Oral presentation winners**

Coral Hillel  
Ailiya Rizwan  
Tamara Kostyuk

## **Poster presentation winners**

Claire Del Zotto  
Elizaveta Yakubovskaya  
Alex Akhundov  
Kristina Issa  
Edman Abukar  
Ethan Sooklal

# Celebrating 15 Years of Science Engagement Programs



**Our Science Engagement Programs (SEP) offer innovative and enriching programming** designed to inspire youth to explore science, technology, engineering, and mathematics (STEM). Programs take place on Keele Campus, as well as within schools, community centres, and other educational institutions.

### The Past Year: 2021

SEP celebrated its 15<sup>th</sup> anniversary. Acknowledging the challenges of the COVID pandemic, we offered both online and in-person programs, when possible, under pandemic restrictions. This past year, more than 3,000 youths in grades three to 12 participated in our programs, including **Online Summer Explorations, Spark Lab** courses, **in-person Science Exploration Camps, STEM Clubs, Science Rendezvous**, and York Science's **CanCode Workshops**. Based on surveys, 94 percent of students would recommend our programs.

The SEP team mailed out more than 3,700 activity bags to online participants across Canada and internationally, including as far away as Egypt, India, Peru, Saudi Arabia, and Turkey.

Not letting challenges of the pandemic dampen the enthusiasm for our offerings,

we saw some of our most popular camps and courses subscribed fully online. For those in grades three to six, that included Space Science, Neuroscience: Meet the Mind, Marvelous Mechanics, and Mini-Robotics. For those in grades nine to 12, Neurobiology and Immunology were most popular.

### Science Rendezvous

In 2021, the annual national science festival Science Rendezvous pivoted to an online event. York Science's virtual site was the second most attended event in Canada. Participants raced (virtually) between event sites across the country, answered challenges, and learned about Canadian research and innovations. Our "Science Chase" event site featured escape-themed challenges, including saving the world with YU Starchaser 1000, diagnosing pet patients at the YU Veterinary Hospital, and using knowledge from the YU Forensics Academy to solve a mystery.

SCREEN CAPTURE  
OF ONLINE CSI:  
CAMP SCENE  
INVESTIGATION  
STUDENTS LEARNING  
ABOUT FORENSIC  
FINGERPRINTING  
WHILE ANALYZING  
THEIR OWN







■ STUDENTS PARTICIPATING IN PROGRAMS

*“It was an amazing journey and I loved every minute of it. It didn’t even feel like a classroom, more like a friendly discussion with my friends. I learned so much and I’m never [going to] forget this.”* —STUDENT FROM NEUROBIOLOGY

*“Exactly what my child needed after a long year of distance learning from the pandemic ... He’s re-inspired and excited [about] learning. Thanks!”*

—PARENT FROM SPACE SCIENCE

## Since 2006...

In 2006, SEP started with one elementary camp and 55 students. Since then, we have grown to offer enrichment programs running throughout the year for students in grades three to 12, in-person and online, in multiple locations and reaching more than 37,000 students over the past 15 years.

Since 2015, SEP has expanded with additional programs, including Mississauga Library Workshops and Camps in partnership with Amgen Canada, Spark Lab Program, PA Day Program, and a fully-subsidized York CanCode Workshops/Camps program. The Spark Lab Program was developed to give high school students easier access to science by using experiment-based hands-on learning. Over this period, we also welcomed back past campers in new roles in the Volunteer Program and some even became instructors.

In 2020, we launched our first virtual Science Explorations Summer Camps and Spark Lab Courses. Through partnerships, and recognizing the economic challenges posed by the pandemic, SEP was able to

offer programs at a drastically reduced cost, allowing all members of the community to attend. Within a couple of days of launch, SEP reached maximum capacity with a waitlist of more than 400. Since our programs were online, we continued to be able to reach students across Canada and the world.

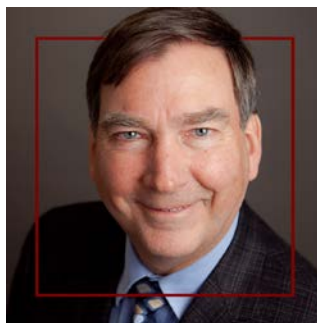
### Partnerships

Over the years, SEP has partnered with many schools, community groups, and organizations to offer programs to a wide variety of youth groups including:

- Actua;
- Science Rendezvous and the City of Markham;
- Amgen Canada;
- Public libraries across the GTA;
- Science Literacy Week;
- York Region Science and Technology Fair;
- STEM Parent Conference; and
- The Toronto District School Board, and private schools.

# Earle Nestmann and Pamela Ohashi Receive York U Alumni Awards

**For 21 years, the York U Alumni Awards** have celebrated alumni who exemplify the values of York University, have made remarkable contributions to their fields, and have changed the world for the better. Two Science alumni were among the 2021 winners.



EARLE NESTMANN



PAMELA OHASHI

### **Earle Nestmann** (MSc '71, PhD '74)

**Outstanding Contribution** – An alumnus/a who has made a significant contribution to the advancement of York and its students through exceptional service, commitment and/or philanthropic contributions.

Nestmann, president at Health Science Consultants Inc., served in the Biology department as assistant professor from 1974 to 1977, and later as a member of the Board of Directors of the Alumni Association from 2006 to 2014 and the Board of Governors from 2013 to 2020.

Nestmann has published more than 100 scientific articles and was co-editor of the proceedings of an international conference on chemical mutagenesis and of a laboratory manual on recombinant DNA technology. He has served on several editorial boards for scientific journals and was president of the Genetics Society of Canada. He was a research scientist at Health Canada and pesticide regulatory manager for a multi-national company before becoming a principal of an international consulting firm. Nestmann continues to consult part-time as president of Health Science Consultants Inc. Together with his wife Berna, Nestmann has provided exemplary philanthropic support for York science students and faculty for over 15 years.

### **Pamela Ohashi** (BSc Hons '82)

**Tentanda Via** – An alumna/us who has demonstrated innovative, unconventional, and daring leadership and success, reflecting the university's motto, "The way must be tried."

Ohashi is the director of the Tumor Immunotherapy Program at Princess Margaret Cancer Centre. Her research interests involve understanding T-cell tolerance as well as strategies to promote tissue-specific immune responses and translating these findings into clinical trials.

Her research has proven many basic principles in T-cell tolerance and identified novel concepts in immune regulation. One of her greatest achievements in the field of immunological science is her contribution to the establishment of an immunotherapy program at Princess Margaret. This involved leading clinical, academic, and industrial players in the field, linking research in genomics and bioinformatics with basic and translational science and clinical trials of novel anti-cancer immunotherapeutics.

# Naz Chaudary: Putting Her Heart into Cancer Research

Driven by a fascination with biology, **Naz Chaudary** (Hon BSc '98, PhD '04) began her undergraduate studies in biotechnology and cell biology – and her 10-year journey – at York University in 1994. Now a researcher at Princess Margaret Cancer Centre, she looks back fondly at her time at York as being the backbone for her career in academic science.

Chaudary was an ambitious undergraduate student who used all of the opportunities at her disposal to learn, grow, and interact with professors and researchers at York. This was how she found herself in a fourth-year Honours Thesis course, an eight-month-long laboratory research project experience, learning from former Biology Professor Imogen Coe (now at Ryerson University), who would inspire her to apply to graduate school and eventually become her PhD supervisor.

“That research course was a turning point for me,” said Chaudary. “I learned how to appreciate the complexities of basic science as an undergraduate student and how scientific experiments were designed. I realized I enjoyed exploring the unknown in science and redeveloping experiments. Dr. Coe taught me from the ground up and was a great mentor.”

With Coe’s guidance, Chaudary received an Honours Thesis Research Award, applied to graduate school, and continued her research in Coe’s lab until she completed her PhD in 2004; she was also a recipient of the Haynes York Graduate Scholarship. Her research was in cardiovascular biology, particularly investigating how heart cells thrive in low oxygen conditions (hypoxia) via nucleoside transporters. She then ventured into cancer research, moving onto a

postdoctoral fellowship in radiation biology at the University of Toronto under the mentorship of Richard Hill before landing a position at Princess Margaret as cancer research scientist.

“Four fulfilling graduate years, at York, as a PhD student taught me how to critically interpret data, think creatively outside the expected results and most importantly never undermine the importance of controls. I believe there is great value in basic science; that foundational experience and knowledge follows you wherever you go.”

As a cancer researcher in the Department of Radiation Oncology at Princess Margaret, Chaudary along with a team of radiation oncologists and biologists, studies how tumour cells thrive in a radiation resistant environment, why some cancer cells respond well to treatment while others do not, and the role of the immune cells in the tumor microenvironment. In the lab, her team micro-surgically develops and uses mouse models that mimic the spread of cancer cells in humans and their response to treatment, with the aim that their findings can help develop better cancer treatments that are not just effective to treat the disease but also less toxic to surrounding healthy cells in the body.

Chaudary received the Exceptional Research Support Award in 2019/2020 in Radiation Medicine Program at Princess Margaret and has authored several scientific research papers throughout her career.



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