DEPARTMENT OF MATHEMATICS AND STATISTICS
FACULTY OF SCIENCE, YORK UNIVERSITY

C
oN
ne
χ
Io

The Chair's Perspective

Paul Szeptycki

As Chair of the department, I am often asked by students and parents about the employment prospects of students graduating from our mathematics and statistics programs. Some of our majors have very clear career options. For example, our Actuarial Program offers our students a very concrete structured path towards employment and advancement in the insurance industry, and our Statistics majors find many potential employers in both the private sector and government (e.g., Statistics Canada). However, many of our students, most notably those in pure mathematics, have some anxiety related to what they can do with a degree in mathematics. I also experienced this same anxiety when I was a graduate student many years ago. A legendary story circulated among my peers about a former graduate student who had completed his PhD and had decided to forgo an academic career. He applied for a number of positions with companies for which he had no formal training or expertise beyond his PhD in mathematics, and obtained an interview at a corporation (or a bank or perhaps an oil company — the story changed depending on who told it). In the interview when asked "you are a pure mathematician living in the clouds, what can you possibly do for us?", he responded: "I am a proven problem solver — you have problems that need solving and so I am perfect for the job." And he was hired! This story was a great source of comfort to me and other students facing a particularly bleak academic job market: it gave us a plan B. Fast forward 30 years, last fall I invited Ken Smith to be our key note speaker at our departmental awards ceremony. Ken Smith is a York alumnus from our department who completed his PhD in mathematics before embarking on a long, interesting and successful career in the private sector, and so his perspective and experiences, I hoped, would be of great interest to our students. We met over lunch a few weeks before the ceremony for me to learn something about his experience at York and his career, and for him to learn something about the current department and our students. And it was not until after lunch that I did a bit of problem solving, put 2 and 2 together and realized that Ken was indeed the source of the legendary story that gave me and my friends solace and
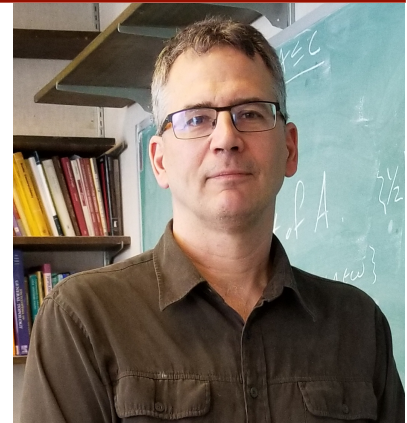
inspiration so many years ago. His talk was a great success and well-received by our students and guests, and he kindly agreed to adapt his speech for this newsletter. I would be very interested to hear about other alumni's career paths, so please email us and share your stories with our students and perhaps give them further inspiration and guidance. We are looking forward to yet another year full of success stories in 2018!

Departmentpedia

Transitions

✤ Hyejin Ku, effective July 1, 2016, was promoted to Full Professor. Her research involves mathematical models and theory for financial applications.

Activities

✤ This year a group of students in our Department, lead by Yohana Solomon, Sahar Jamali, Allysa Lumley, and Snezhana Kirusheva, founded a student chapter of the Association for Women in Mathematics. The AWM is an organization committed to the advancement of equity within mathematics, and York's AWM chapter is only the second such student group in Canada. With official status recently granted by the AWM, the group plans to begin hosting events in the new year.

✤ John Fox (McMaster University) and Georges Monette (York University) presented a week-long workshop in July 2017 on Models for Longitudinal Data in R and Stan. The workshop was sponsored by the University of Michigan's Inter-University Consortium in Political and Social Research (ICPSR).

✤ Amy Wu was a keynote speaker at the Science Atlantic Conference for Mathematics, Statistics and Computer Science held in October 2017.

Graduate Students Recognitions

✤ Affan Shoukat received Manulife Award for his research on health economics of vaccination programs.

✤ Angie Raad received the Carswell Scholarship at the Faculty of Science. She won the Queen Elisabeth II award.

✤ John Campbell received the Carswell Scholarship at the Faculty of Science. His work on "Visualizing large-order groups with computer-generated Cayley tables" was featured on the cover of Volume 11, Issue 2 of Journal of Mathematics and the Arts

✤ Our graduate, Vera Fischer was awarded a prestigious START grant from the Austrian government (https://www.fwf.ac.at/en/research-funding/fwf-programmes/start-programme/). Vera completed her PhD program with Juris Steprāns.

Congratulations

✤ Warmest congratulations on the birth of Theodore by the Furmans, and Taylor Scott by the Haslams.

On October 4th, 2017, the department along with York's Career Centre organized a Career Panel on Statistics and Data Science. Students got the opportunity to meet with professionals currently enjoying their careers and get the inside scoop on what it's really like to work in this field. During this panel, professionals shared their personal stories about breaking into the field, how their career paths took them from graduation to where they are now, what knowledge, skills and experience helped them succeed in their jobs and what types of opportunities are available in the field. Thanks to everyone that helped out and to all that participated! We hope to make this an annual event in the future.

In 2016, the department hosted its first Canadian Mathematics Kangaroo Contest (https://kangaroo.math.ca/index.php). This popular and fun contest aims to inspire the beauty and creativity of mathematics to young minds (grades 1 to 12). It is also an excellent opportunity for those living in the York region to visit and learn about our department and the types of mathematics we conduct. To give the scope of these contests, in 2017 the department hosted 278 contest writers, and over 15 volunteers helped with preparations and invigilation. In both 2016 and 2017 Ada Chan was the principal faculty organizer. In 2017, she also organized a post celebratory awards ceremony to recognize the mathematical achievements of our contest writers. Paul Szeptycki hosted this ceremony and Jane Heffernan also spoke about "mathematics in the world around you". Expanding on past success and in preparation of the 2018 contest, starting in January, we will be providing weekly learning sessions leading up to the annual contest in March. These learnings sessions are lead by the generous volunteer efforts of our department's graduate students, alumni and undergraduate students from mathematics, education and integrated science. Ada Chan and Amenda Chow are the faculty members supervising these endeavours. To learn more about the departments' Kangaroo efforts, please visit http://mathstats.info.yorku.ca/math-kangaroo/

Canadian   **Mathematics**

Kangaroo   **Contest**
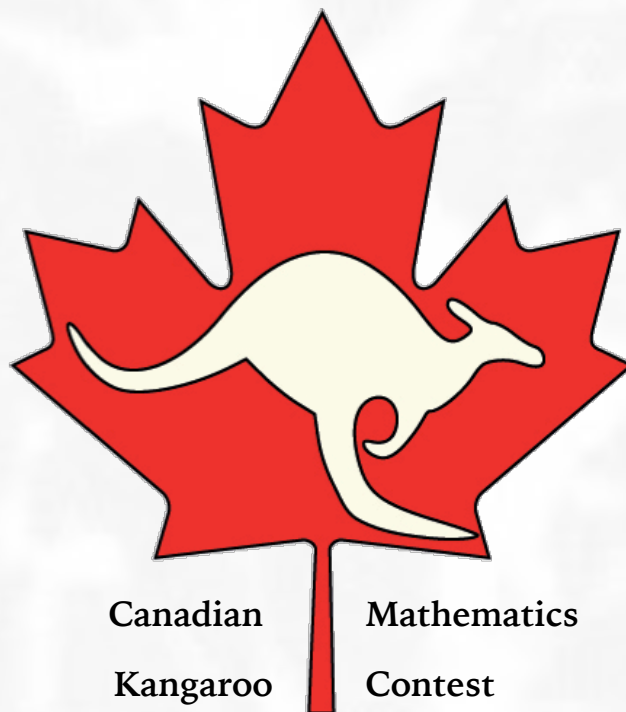
New Alumni

At convocations in 2017, 43 students received graduate and undergraduate degrees in Mathematics and Statistics departmental programs:

PhD in Mathematics and Statistics:

Yousef Akhavan, Farid Aliniaeifard, Pavan Aroda, Yurong Cao, Yaser Eftekhari, Silva Konini, Qiong Li, Xiaoying Sun, Alessandro Vignati, Nanwei Wang, Hai Zhang

MA/MSc in Mathematics and Statistics:

Salwa Abbas Al Harbi, Yehya Althobaity, Neda Aminnejad, Wenqian Chang, Hassan Chehaitli, Bo Gallant, Quan Hong, Sahar Jamali, Snezhana Kirusheva, Gregory Christopher Kuling, Richard Le, Jeeyoung Lee, Kaiyan Lin, Hao Liu, Bushra Majeed, Pourya Memarpanahi, Najla Muzhir Muhee, Insiyah Panju, Maninder Kaur Sarai, Yohana Solomon, Sukun Wang, Carly Catherine Anne Wilkinson, Xiaodi Wu, Carmen Yeung, Shaohua Yu, Honghao Zhang, Yuan Zhong, Anmin Zou

Graduate Diploma in Financial Engineering:

Snezhana Kirusheva, Richard Le, Kaiyan Lin, Sukun Wang

2016–2017 Undergraduate Student Awards

Our annual award ceremony was held on November 29, 2017 in the Senate Chamber. Opening remarks were delivered by Professor Paul Szeptycki and Associate Dean Esaias J. Janse van Rensburg, Faculty of Science. The awardees were:

George R. & Mary L. Wallace Award

'Actuarial Science'
Michael Meckler
Luqi Zhang

'Operations Research'
Ling Lin

Emerson Vincent Sauder Memorial Scholarship

Jiyu Wang

Abe Karrass - Donald Solitar Mathematics Award

Megan Kim

Irvine Pounder Award

Jacob Karon (1st Year)
Jordan Teitelbaum (2nd Year)
Chi Zhang (3rd Year)
Stanislav Balchev (4th Year)

NSERC Summer Research Award

Nicholas Chrobok
Vadim Semenikhine
Dean Vaksman

Dean's Undergraduate Research Award

Ling Lin
Sunqiaohe Zheng

Alice Turner Award

Justin Kim
Stanislav Balchev

Moshe Shimrat Prize

Yixin Chen

Actuarial Examinations

Angelica Abate (FM)
Mingjie Zeng (FM, P)
Ingi Hong (FM, P)
Xiang Li (FM, P)
Yao Li (FM, P)

Mathematical Contest in Modelling

Team 1:
Samuel Dupuis
Justin Kim, Daniel Ruiz
Problem Targeted: "Cooperate and Navigate"
Team 2:
Alireza Tajadod
Ling Lin, Jiyu Wang
Problem Targeted: "Merge After Toll"

Putnam Competition Participants

Stanislav Balchev   Yixin Chen
Samuel Dupuis   Armita Jalooli
Albi Kazazi   Justin Kim
Jordan Teitelbaum
Daniel Ruiz

Chair's Honour Roll

Lauren Adams
Hussein Ahmad
Gian Alix
Xiaoyu Bai
Stanislav Balchev
Nicole Blyuss
Bernardo Cardona
Breanna Charbonneau
Divya Chaturvedi
Monahil Chaudry
Yaxin Chen
Dawood Choksi
Victoria Chow
Peter Ciccocioppo

Adam Del Zotto
Yash Dhamija
Angelica Di Loreto
Li Du
Samy Elias
Gina Faraj
Edric Franco
Jay Han
Jenny Hua
Alessa Ivascu
Kevin Joseph
Jacob Karon
Daniel Khoshnood
Nhan Le
Alireza Shaghouzaei

Thi Le
Min Jae Lee
Yongci Lei
Xiang Li
Van Man
Michael Meckler
Emilie Miranda
Ashkan Moatamed
Richard O'Shea
Andi Qian
Xinglin Qiang
Guanfu Qiao
Ali Selseleh
Marisa Signorile
Tahmoores Radkhoshnoud

Tomasz Szczypka
Jordan Teitelbaum
Vima Villalba
Albert Wang
Jiyu Wang
Yingqi Wang
Shixi Xiao
Christopher Yip
Heung Win
Baoqi Yu
Xingying Yu
Chi Zhang
Yi Zhang
Puyuan Zhao
Qiyue Zhao

Canadian High School Math Competitions

The Canadian Open Mathematics Challenge (COMC) is a major national mathematics competition that is open to all high school students. It is written in the fall by thousands of students in Canada, as well as hundreds of students in other countries. The COMC is the principal route for Canadian students to qualify for the Canadian Mathematical Olympiad (CMO), Canada's "premier national advanced mathematics competition," which is written by about 80 invited students each year [https://cms.math.ca/Competitions/CMO/#]. Both competitions are sponsored by the Canadian Mathematical Society (CMS). Members of the Department of Mathematics and Statistics at York are actively involved in these competitions.

For the COMC, a network of partner universities across Canada is coordinated by the CMS for the purpose of marking the thousands of papers. For the third consecutive year, York has been the university responsible for marking the papers written by students outside of Canada — approximately seven hundred each year. In 2017, the volunteers responsible for handling the COMC papers at York were professors Michael Chen, Amenda Chow, Rick Ganong, Yun Gao, Alexey Kuznetsov, Neal Madras, Paul Skoufranis, Juris Steprāns, Mike Zabrocki, and Hongmei Zhu, and postdoctoral fellows Gokhan Yildirim and Xianghong Zhang. For more information, visit https://cms.math.ca/Competitions/COMC/2017/.

York is currently in the fourth year of a five-year commitment to being the base of the Canadian Mathematical Olympiad. The competition logistics are organized by the CMS, but a committee consisting of people at York and elsewhere is fully responsible for creating the five problems that appear on the CMO, and for marking all the papers in April. The committee is chaired by Neal Madras, and its (current and recent) members include Ada Chan, Ilijas Farah, Rick Ganong, Alexey Kuznetsov, Youness Lamzouri, Igor Poliakov, Paul Skoufranis, and Mike Zabrocki. The committee also received marking assistance from former York faculty member Felix Recio.

A Mathematician's Career in Business

Forty-two years after graduation, I can tell you that the York Math and Stat Department had a profound influence on my life, so I am honoured to be part of the ceremony today.

I remember my parents asking: "but what can you do with all this abstract math?" At the time, I didn't know, other than teach. It took me many years to answer the question so I thought I would share my alternate career story with the students and parents present.

In short, by studying mathematics I learned how to solve hard problems. The world has lots of hard problems to solve. I have enjoyed a career solving problems in business as a strategy consultant. I thought I would summarize my journey – a few messages will come out in the telling, which I will summarize at the end and then take questions.

The journey was unplanned, but in hindsight had 4 phases:

Phase 1: Academic phase – "*Do what you love if you can!*"

I loved math. I graduated in Mathematics from York in 1975 and then pursued graduate studies at the University of Toronto, completing a PhD in Logic in 1979. Logic is in an area of mathematics sometimes called meta-mathematics, meaning math about math – about as abstract (or impractical) as you can get. So you can understand my parents' concern.

Ken Smith
Class of 1975

I might have pursued an academic career, but the timing was bad. In 1979 the road to tenure track positions was long, and my wife and I, expecting our first child, wanted more security. Hence, this took me to the second phase.

Phase 2: Learning business – "*Do what you love if you can, otherwise love what you do!*"

I knew nothing about business, but somehow got offers. I joined Imperial Oil

and threw myself into it. I immediately found the work interesting and my skills relevant. However, I needed to understand business better and picked up an MBA part-time.

Within a few years, I was asked to lead the Management Science group. Our team did math-based problem solving all over the company, from service station staffing algorithms to optimization of steam injection in the early stages of Cold Lake development. The variety of projects and the impact of project-based work led to my interest in strategy consulting.

Phase 3: Strategy consultant – "*Wow; you can solve hard business problems for a living!*"

This is the main part of my career. I worked full-time in strategy consulting from 1986 to 2010, first with McKinsey & Company and lastly with a Canadian boutique SECOR, which I chaired. We always worked in teams – working with (and learning from) bright, motivated people is one of the great benefits of the profession. Another unique benefit is that you don't get promoted out of the front-line problem solving work – leadership roles are part-time and the most successful consultants

continue to solve client problems.

I've selected three sample experiences to illustrate the nature of the work:

❖ First, I'll describe a typical 3-month strategy assignment for a team of 3 or 4 people – such as the turnaround strategy for a failing business. Usually, the math is easy but the problem solving is hard. The most interesting part is figuring out how to take apart a business and put it back together in a better way. Analysis of markets, operations, and many aspects of finance (e.g. cost of capital, net present value, valuation) require basic math. And unlike school, a great solution is worthless if not implemented.

❖ Later, I did projects, research and writing related to mergers, acquisitions and industry restructuring. This led to some participation in the dialogue on how to fix the regulation of the financial services industry after the 2008 crisis. A debate raged over whether the new regulation should be rules-based or principles-based. My one and only reference to formal logic during my consulting career was to invoke Gödel's Incompleteness Theorem

to argue that rules-based regulation wouldn't work. That didn't stop US regulators from adopting a rules-based approach, which is already failing.

❖ One of the most challenging problems was the global crisis in medical isotopes in 2007. This was a complex problem triggered by the breakdown of Canada's research reactor that had been providing 40% of the world's supply of isotopes used in diagnostics and cancer treatments. We worked internationally toward collaboration of the remaining suppliers and to focus supply on the most life-critical procedures. Later we helped assess alternate technologies for isotope production to reduce reliance on aging reactors.

Overall I worked on about 130 problems in 20 different industries. I welcomed each new industry, and the harder the problem the better. I find this to be a common characteristic of mathematicians – fascinated by a new problem and undaunted by the challenge.

A memorable moment was when a prospective client was describing a very difficult problem with a morass of legal, technical and business issues. I was so fascinated by

the complexity of the problem that a grin appeared on my face and the client noticed. "Why are you smiling?" he said angrily, "there is over a $1 billion at risk!" I answered that I was simply fascinated by the difficulty of the problem. "Do you know how to solve it?" he demanded. I replied: "I only know there is a solution and I think we can find it." Remarkably, he gave us the assignment – our work saved 100% of the $1 billion at risk.

Phase 4. Semi-retirement phase – "*Still doing what I love and helping others learn how.*"

I'm now coaching CEOs in my role as a director of several small companies. I continue to take on selective strategy assignments and I do some teaching of strategy.

In summary, I feel privileged to have worked on many, many interesting problems in school and in business. I can't imagine a more interesting career than strategy consulting – the variety, the challenge, the continued learning**.** However, I know the world needs more brilliant problem solvers in all aspects of business, government, academics, NGOs, etc. So do what you love, and if you love problem solving then it won't be hard to love what you do.

Congratulations to all awardees !

Integrated Science Program (ISP):

Professors in the Math & Stats department have been involved in launching the new Integrated Science Program at York. Having started in Fall 2016, Integrated Science is a first-year program in Science designed for strong students who want to take the four main first-year science subjects — Physics, Chemistry, Biology, and Calculus — while exploring the interdisciplinary connections among them. Class size is limited to 48 students so as to permit more active learning and group work in class. The topics for each subject are scheduled to reinforce key concepts and eliminate duplication.

There is one professor for each of the four subjects. The content of each subject corresponds to the usual first-year 6-credit course in that subject, which for Math is similar to the Applied Calculus courses. Students also take the standard first-year labs in physics, chemistry, and biology.

After completing the one-year ISP, each student enters a regular Science program for the second and subsequent years. Biotechnology and biophysics have been popular choices.

Classes meet for a four-hour block on each Monday, Wednesday, and Friday. Within each block, the subject schedule varies from week to week. Students are expected to do preparation for each class, which typically includes reading sections of the textbook, answering some short questions or problems (to be marked pass/fail), and/or preparing for a "readiness assessment" quiz during class. These math quizzes are multiple choice, first answered individually using "clickers", and then answered in pre-assigned groups.

Besides regular problem sets for homework, the students also work on "Integrated Assignments" in teams. There are three such assignments per term, each focusing on some interdisciplinary topic that goes beyond what is in the curriculum. Past topics have included the possibility of life on Mars, sustainable harvesting of natural resources, and how the nervous system transports information.

Professor Neal Madras has been teaching the Integrated Science course since it began. Professor Paul Szeptycki was also heavily involved in the planning of the program.

◆

Interview with Professor Milvesky

Moshe Milevsky is Professor of Finance at the Schulich School of Business, and is an award winning author columnist and researcher, having written 14 books and many influential academic papers. He is an expert on financial and insurance products that involve both financial and longevity risk and is interviewed frequently on television and in other media. He is regularly a keynote speaker at meetings of financial advisors and other professionals in the worlds of finance and insurance. He has even won the Globe and Mail's stock picking competition 3 years in a row.

But before all that, and before pursuing a PhD in Finance, Dr. Milevsky was a Master's student in York's Department of Mathematics and Statistics. We sat down to talk about how that experience has influenced his career.

Can you tell us how you came to be a student at York?

Moshe A. Milevsky

I had finished my undergraduate degree at Yeshiva University in New York and was moving back to Toronto. I was enthusiastic about studying mathematical physics. York's graduate program director at the time was Prof. George O'Brien, and he convinced me that there was a lot I could learn at York.

What can you tell us about your time as a math student?

What I most valued was the access I had to faculty. I had broad interests and lots of questions. In addition to being passionate about what they were teaching in class, I always found people accessible and helpful when I would come to them with questions about Maple, statistics, Monte Carlo, gravitation (which was the topic of one of my projects) or probability and even measure theory. Being a graduate student was a lot of fun and I have very pleasant memories of my time as a masters student in the math department.

What happened then?

By chance I met Professor Eli Prisman from the business school, who convinced me that I could do interesting things in finance by using all the math and statistics that I'd been learning. So I completed my MA and then moved over to the business school and studied finance for my PhD. But I'd also got in the habit of meeting with some of the math folk to talk about my research over coffee. That continued after I got my degree, and they've become friends and collaborators (and even business partners). One of them (Tom Salisbury) gave me my very first course at York University (differential geometry), and ended being a member of my PhD committee.

Please tell us what you're working on now, and what you think our students should focus their attention on.

I'm interested in how to improve the personal financial and insurance decisions that people make in their daily life, given the increasing amount of data they can tap into, not just about the economy, but about their health and how fast they will age. So many questions now are data-driven, so I'd encourage even all students to expose themselves to data, statistical techniques and the software packages used to analyse vast amounts of data – even if you are studying to be the theorist. That's a trend I think will continue.

Thank you!

The Fields Undergraduate Summer Research Program was featured in the weekend edition of the Globe and Mail. This program focused on teamwork and real-world problems. Peter Gibson (right) helped guide the students.
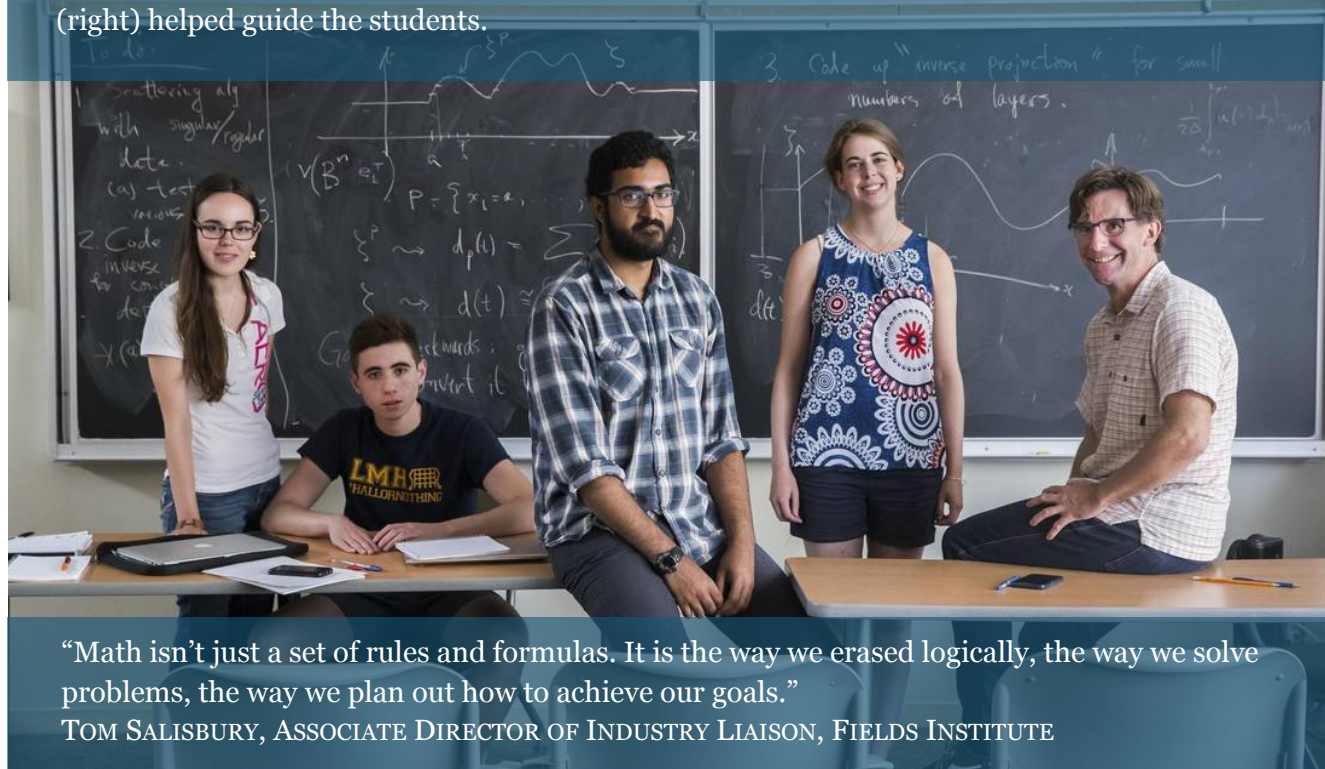
"Math isn't just a set of rules and formulas. It is the way we erased logically, the way we solve problems, the way we plan out how to achieve our goals."
Tom Salisbury, Associate Director of Industry Liaison, Fields Institute

Write to Connexio:

YORK
U
UNIVERSITÉ
UNIVERSITY

science