

QUEEN'S MATHEMATICAL COMMUNICATOR

FALL 2020

An aperiodical issued by the
Department of Mathematics and Statistics
Queen's University, Kingston, Ontario, Canada K7L 3N6



WELCOME FROM THE HEAD, JAMIE MINGO



As I write this we are facing one of the greatest challenges to university education and research in 50 years. Students today are struggling with global warming, the COVID pandemic, and anti-black racism. It is increasingly clear that mathematics and statistics will play a big role in overcoming these challenges. Never before have we seen so much in the media about exponential growth, probability distributions, and dynamical systems.

Sheltered here in Kingston we have been spared the worst of these problems, but we remain conscious of the need to be careful. I expect Queen's students to rise to these challenges and bring leadership to our troubled world.

The way we teach and learn, always a subject of debate, is changing rapidly as we adapt to the new normal. Enrollments in our programs are at an historic high and the numbers we have for the upcoming Fall term suggest that this trend will continue. These seems to be attributable to a surge in interest in the mathematical and statistical sciences and the appeal of recently hired faculty members.

We wish you all the best, especially in these times, and are always happy to hear from you.

DEPARTMENT NEWS

FELICIA MAGPANTAY

CANADIAN FOUNDATION FOR INNOVATION'S (CFI)
JOHN R. EVANS LEADERS FUND (JELF)

Felicia was [awarded](#) \$150,000 in the latest round of CFI funding. The objective of her research program is to derive new methods in mathematical analysis and statistical inference of mechanistic models to aid in our understanding of infectious disease systems. The focus will be on systems that exhibit long-lasting transient dynamics (e.g. the honeymoon period of childhood diseases after the start of mass vaccination campaigns) and complex dynamics arising from delays in the system (e.g. the effect of delays in public health interventions during epidemic outbreaks).

The John R. Evans Leaders Fund helps exceptional researchers at universities across the country conduct leading-edge research by giving them the tools and equipment they need to become leaders in their fields.



JAMIE MINGO

FIELDS INSTITUTE FELLOW

Starting in 2002, the Fields Institute has each year appointed a small number of Fellows. These lifetime appointments recognize individuals who have made outstanding contributions to the Fields Institute and its activities. Jamie Mingo was one of two Fellows named in 2019.



BAHMAN GHARESIFARD

HUMBOLDT RESEARCH FELLOWSHIP

Bahman has been awarded a [Humboldt Research Fellowship](#) from the Alexander von Humboldt Foundation.

The Humboldt Research Fellowships enable highly-qualified scientists and scholars from abroad, who completed their doctorates less than twelve years ago to spend extended periods of research in Germany.

Bahman is currently in Germany collaborating with colleagues in Stuttgart. Travel uncertainties will determine his movement but he plans to be teaching on campus in the winter.

I asked Bahman to tell us a bit about his research project and I found his response remarkable. The powers of our new technologies (machine learning) are changing the way we view uncertainty. Bahman replies:

“The problem under study here is about the interplay between “stability” and “performance” in decision making. There are many scenarios where we can at best provide optimality guarantees for the decisions made “asymptotically”, i.e., in an infinite horizon of time. As problems get more complicated, we cannot give such guarantees, and even if we do, they only hold asymptotically. But in practice, as we can count on more computational power, we need only look at a finite horizon of time, and make decisions for only one or two steps at a time. We then move the horizon forward and recompute.

“As control theorists, we are often worried about stability; we don’t want systems to go unstable, ever. So, in making these decisions, we are very conservative. But the drive to enforce stability prevents exploratory decision-making and ultimately this drops system performance.

“This is not the case for folks who work on machine learning problems, where dealing with unknowns and lack of robust models is often part of the setting. For them, stability is not the main concern, but performance is.

“The same goes for estimation problems (i.e., make an input, observe the output and draw conclusions about the states), where again as control theorists, we always worry about the possibility making the system unstable. When we formulate all this mathematically, we can capture how much “regret” we accumulate over time by making conservative decisions.

“The interesting question now is whether we can strike a balance. This would have been a taboo a decade ago in control theory, letting stability go, but with the emergence of techniques from machine learning and the abundance of data we have access to, we are learning that we can implicitly regularize a system. In a sense, rather than enforce stability, we can learn the beats of the system over time, and drive safely with that.”



TROY DAY

APPOINTED TO THE PROVINCIAL COVID-19 MODELLING CONSENSUS TABLE

The Table is composed of people with expertise in a variety of areas including public health, epidemiology, infectious disease biology, data sciences, and mathematics and statistics. One of its main goals is to use mathematical models to rapidly address questions about the likely consequences of different public health interventions in the control of COVID-19.

Over the past months, we have seen the Covid-19 dynamics unfold in ways that last April might have surprised many of us, but with hindsight might well have been predictable.

On June 30 Troy gave a talk at the Fields Institute with the [Title](#) The Political Economy of Infectious Disease Outbreaks. The talk described how standard models of 2-person game theory (such as the prisoner's dilemma) can be used to provide a better understanding of the ways in which government regulation can and should combine with our own personal and economic interests to produce a hopefully "optimal" outcome. One of the interesting features of his talk was the observation that in any epidemic, "the game changes" when there is a noticeable risk of asymptomatic infection. That is one of the main differences between the 2003 SARS outbreak (which lasted only 6 months) and COVID-19. The other main difference appears to be the high infectivity rate of the current coronavirus.

Troy and his colleague Felicia Magpantay are members of a current project of Canada's Digital Technology Supercluster. The [project](#) is called:

Looking Glass: Protecting Canadians in a Return to Community

The objectives of the project are to obtain clear, evidence-based understanding of the impact of decisions made to protect the health of Canadians is needed to inform good policy making. This project will provide possible benefits and risks based on science-driven modelling to better inform public policy and practice, for government and industry, as physical distancing measures, reopening of schools and businesses, and widespread testing are considered, and the country looks towards a return to work and community.



When asked last April about his role around this Provincial Table, Troy commented:

Much of the research that my group does centres on developing mathematical theory for the epidemiological and evolutionary dynamics of infectious diseases. I am one of several people on the Table that conducts this type of research and together our goal is to draw on several mathematical results and models (both from our own work and that of others) to form a consensus opinion about the likely future dynamics of COVID-19.



Felicia at the L. Lorne Campbell Lecture

ABDOL-REZA MANSOURI

PROMOTED TO FULL PROFESSOR

Currently Chair of the Mathematics and Engineering program. The program has grown enormously over the past five years.

I am very honored to receive this promotion. I view it first and foremost as a testimony to the excellence of the graduate students I have had the privilege of supervising or co-supervising over the years, many of them graduates of our very own Mathematics and Engineering program. Supervising excellent graduate students is not only pure joy, but also a source of constant challenge, leading to always novel research directions and interests.

This is how, starting from Nonlinear and Geometric Control Theory, my research interests have grown to recently encompass, among others, relatively distant areas such as Inverse Problems and Stochastic Analysis. On the latter topic, I have been privileged to benefit from a collaboration with excellent graduate students at the University of Oslo and at the University of Sarajevo as well. I enjoy teaching Mathematics at all levels, from first year introductory Linear Algebra all the way to specialized graduate level topics courses. The joy of that effort, as well as its challenge, is to convey a sense of the beauty and unity of the subject, and to constantly inspire students.

In this regard, I believe we are very fortunate here at Queen's to have excellent undergraduate students as well, and it is especially rewarding to witness and accompany their evolution from first year students to accomplished independent researchers. With recent developments forcing a move to technology-heavy modes of course delivery in the near future, the key challenge will be to overcome their imperfections so as to continue to inspire students, both undergraduate and graduate.



SERDAR YÜKSEL

PROMOTED TO FULL PROFESSOR

Serdar joined Queen's in 2007. He was offered the Queen's position during the final year of his doctoral studies at the University of Illinois at Urbana-Champaign where he studied under Professor Tamer Basar; Queen's allowed him to spend a very productive year at Yale as a post-doc prior to his start. At Queen's, Serdar has been very fortunate to have excellent colleagues and staff, outstanding graduate students, and a mathematics and engineering program that has been an ideal match. His dedication to graduate student training has also been evident when he became our graduate coordinator, which saw an increase in the number and general quality of applications as well as an enhancement of degree requirements under his leadership.

Serdar's research focuses on the many ways in which information affects control and how information is shaped under various restrictions.

- information rates needed for some controller to be able to stabilize a system,
- optimal control subject to a given information structure provided to a controller,
- topological and geometric properties of information structures in control theory,
- comparison of information structures in control theory and stochastic games,
- optimal design of information structures subject to data rate constraints, and finally,
- the impact of having incorrect or incomplete information on optimal control and related robustness and learning related questions.

These problems find significant relevance in various disciplines but they are all connected through control, information and probability theories. At Queen's, we have been very fortunate to have a tradition of intense activity in each of these areas, and this has allowed our graduate students to receive an excellent training and to make significant contributions. Serdar has co-produced two books and his team has received several recognitions for research. His students, with whom he maintains a close contact, have pursued fulfilling research careers.



WE WELCOME A NEW MEMBER OF **FACULTY**

HOK KAN (BRIAN) LING



Brian Ling was appointed Assistant Professor on July 1, 2020. He graduated from the Chinese University of Hong Kong, with a BSc in Quantitative Finance and Risk Management (minor in math) and an MPhil in Risk Management. Brian received his PhD in Statistics from Columbia University. His current research is often motivated by problems in survival analysis and event history analysis. Specific research interests are in nonparametric and semiparametric estimation, shape-constrained statistical inference and latent variable models, from both methodological and applied sides.

Outside of Statistics, Brian enjoys playing flute and shakuhachi (a Japanese bamboo flute). He also likes photography.

WE WELCOME A NEW **DEPARTMENT MANAGER**

JEANANNE VICKERY

JULY 2019



Jeananne has a BA in Psychology from York University and has worked at Queen's for the past 11 years in a number of roles including:

- Project Administrator, Centre for Energy & Power Electronics Research (ePOWER), Electrical and Computer Engineering
- Research Facilitator, University Research Services
- Graduate Assistant, Political Studies

She has also worked as a Behaviour Therapist with young children on the autism spectrum.

WE WELCOME TWO NEW MEMBERS OF **STAFF**

MIKE CABRAL
ARTS AND SCIENCE PROGRAM ASSOCIATE
AUGUST 2019



As an undergraduate, Michael studied mathematics and philosophy at Queen's. After graduating, he taught English as a second language in South Korea, before returning to Queen's to complete a Master's degree in mathematical biology. He is working towards a doctorate in mathematical biology, with a special interest in evolutionary game theory and dispersal in structured populations. Michael also has a keen interest in mathematics education, through his involvement with high school curriculum development, summer math camps, as well as undergraduate instruction in evolutionary game theory and linear algebra.

VISHNUPRIYA PENDANATHU PAJAN (PRIYA)
MATH & ENGINEERING PROGRAM ASSOCIATE
NOVEMBER 2019



Priya comes to us from Simon Fraser University as well as the Midas Polymer Compound PVT and the Ananthapuri Research Institute. She brings with her experience as a Process Engineer and a Biomedical Quality Engineer. In addition to her work experience, Priya has completed her Master's Degree in Engineering Science from Simon Fraser University as well her Bachelor's Degree in Technology Electronics and Biomedical Engineering from the Model Engineering College.

FAREWELL TO...

CLAIRE O'BRIEN, DEPARTMENT MANAGER

APRIL 2019



Claire O'Brien joined us as Department Manager in December 2017. She left us in April 2019 to take the position of Manager, Student Services, in the Faculty of Arts and Science. During her time with us she oversaw significant changes in the way the life of the department was organized and run.

Happily a number of us still has regular contact with her through our many interactions with the Faculty office.

ALAN ABLESON, ASSISTANT ADJUNCT PROFESSOR

DECEMBER 2019



Twenty years ago, Alan was a PhD student in the Department working with David Thomson when the “double co-hort” hit increasing the size of our first-year courses during a 2-year period. Alan was hired as an additional instructor and was so successful at this that he took a year to write his thesis and then returned to the Department as an Adjunct faculty member. From that point on he has played a critical role in our large course offerings, in course design and delivery, organization and technology, and notably, in teaching. “Ableson’s” APSC 171 lectures were quite simply the standard.

Alan developed a significant expertise in the design and delivery of online courses, an enterprise that as we all know has ballooned in significance over the past years. This coming year in fact, with all of our courses going online, Alan’s online MATH 121 is being used as a core resource.

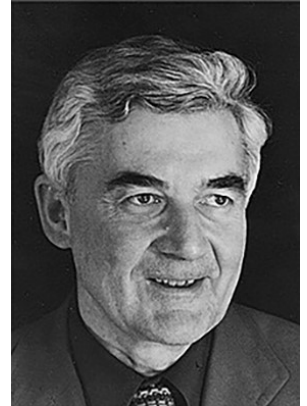
Happily Alan is not going far. He has been appointed as a tenure-track Assistant Professor in the Queen’s Department of Mechanical and Materials Engineering and will continue to teach the first-year APSC math courses alongside Peter Taylor, Fady Alajaji, Ping Li, and others from our department.

GRAND OPENING OF THE PROFESSOR A. JOHN COLEMAN UNDERGRAD LOUNGE

October 19, 2019

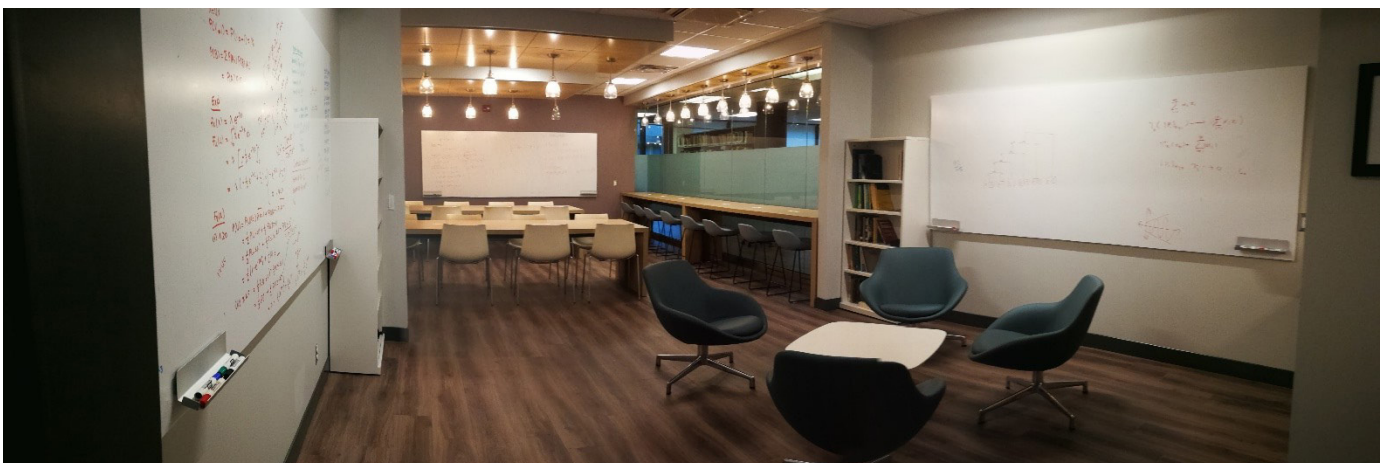
The inspiration and major donor behind this project is Tom Higgins, Artsci'79. Tom discovered a love of math early in life. As a young boy, he spent many summers at his family cottage with his uncle, a professor at MIT. "He showed me that math is everywhere. And he made it fun, so I really didn't need much encouragement to pursue it."

With this gift, Tom pays homage to one of his favorite professors. The lounge is designed to be a welcoming space that draws students together to encourage group learning and friendship.



< Tom with Barbara Crow, Dean of Arts and Science and undergraduate Celia Wong (Arts '23)

Photo courtesy of Siobhain Broekhoven



^ A view of the A. John Coleman Lounge

OUTREACH: MATH QUEST

Comments and photos by the camp director, Siobhain Broekhoven.

Since we could not gather on campus this summer, we had a virtual math & stats escape room designed by **Yuliya Nesterova** available on our [Facebook page](#). Yuliya devised some Neowise comet questions for all to enjoy, along with ones related to our past sessions, including puzzles about our amazing [2019 program](#).

Vasundhara, a graduate student in the Physics Department studying AstroParticle Physics, designed a session on “Fascinating Fysics Formulations” with experiments that showed that the “laws” of physics are really mathematical formulas.

Here we see **Neil MacVicar**, a graduate student studying Analysis, Geometry and Topology, interacting with students during this session. >



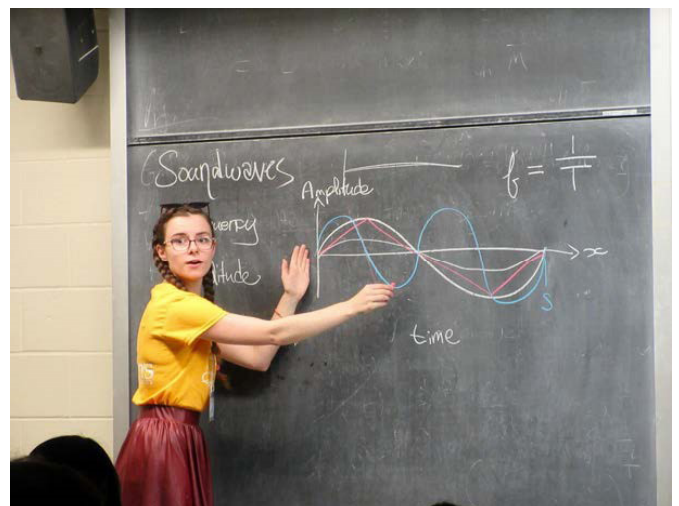
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Skyepaphora Griffith ran a Magical Music session. Coloured chalk, musical instruments, a sine-wave generator and coding in R--Skye used a full range of devices for understanding multiplicative (geometric) vs. additive (arithmetic) sequences and relationships, building and interpreting simple and complex waveforms, and answering the question, why are there 12 notes in a scale?



Skye is a graduate student studying Probability and Statistics. She is also part of the RabbitMath education research team.





^ **Hope Yen** teaching coding in Python at the Integrated Learning Centre. Hope has collaborated as part of the Math Quest team since 2017 while doing her undergrad majoring in Life Science (minoring in math) and now doing graduate studies in biostatistics on her path towards medical school.

Math Quest participants were introduced to block printing at the Agnes in a session with **Alexa Irvine**, a 4th year concurrent education student majoring in Art History, and Fine Arts student **Amelia Rankin**. They were designing images that would be mirrored. This lead to a later session in trigonometry with **Peter Taylor** using a RabbitMath problem involving...mirrors! ♥



OUTREACH: MATH KANGAROO 2019

Although the Math Kangaroo contest was held online this year due to pandemic, last year was great.

Once again **Jordan Morelli**, with Engineering and Applied Physics, organized tutoring sessions and the Kangaroo Contest in March with Siobhain, and we celebrated the results in June at the Math & Stats Department with Troy Day, the Associate head of the Department, handing out medals and ribbons.



Jordan, Siobhain, tutors and participants March 24th at Stirling Hall just before the contest begins.



A big win for the Nediak family! All were Regional 1st Place winners: Anna & Dorothy winning gold and silver medals, and Leonid coming in 3rd place in all of Canada for gr. 12.



Troy, Siobhain, and the regional winners of every grade level on June 23rd at Jeffery Hall.

RABBITMATH WORKSHOP

OTTAWA, August, 2019

RabbitMath held a Fields Institute sponsored Grade 11 workshop in Ottawa in August 2019. With 27 teachers and a number of undergrad and grad students in attendance we were able to give the teachers a first-hand experience with some new kinds of high school problems.

In Grade 11 the students have their first encounter with the formal idea of function and much time is spent relating algebraic and graphical constructions. In this novel problem the “landscape” graph on the left has two towns A and B and any point P in this graph gets mapped to the “distance” graph onto the point $(DA(P), DB(P))$, whose coordinates are the distances of P from A and B respectively. In the diagram below, the images of all the lines and circles are mapped except for the red circle in the middle. Can you find the image of that?

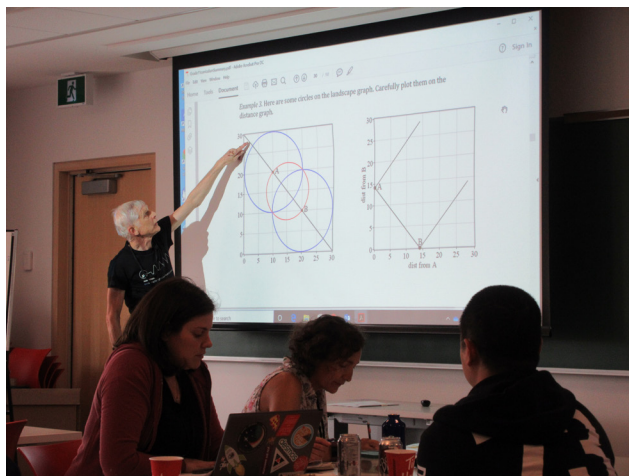
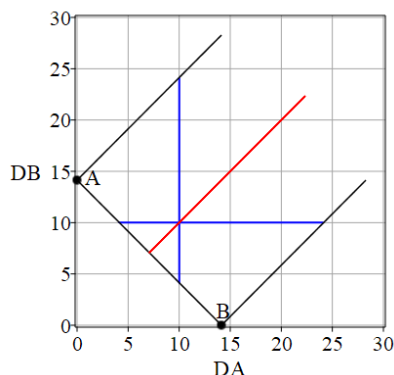
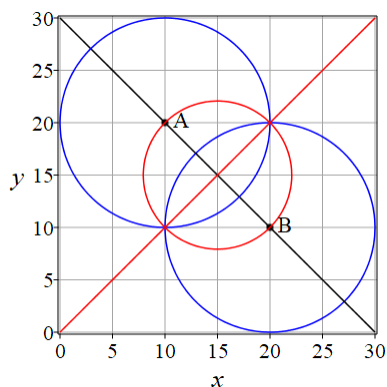


Photo courtesy of Siobhain Broekhoven



We find that grade 11 students (and their teachers!) need to spend considerable time “getting hold” of this mapping, but it’s a good problem to develop facility with transformations and coordinate systems.

This summer (2020) RabbitMath is working with a group of some 15 students and teachers to develop problems for the grade 12—a mixture of analysis of functions, calculus and discrete mathematics.

A fun example is the shoe-swing problem. While on a swing, a child’s shoe comes flying off, arcs through the air, and lands a distance d from the centre of the swing. Find the take-off point that will maximize d . For this problem, we make the assumption that the swing (a pendulum) follows the sine law—an approximation that is valid only for small amplitudes.

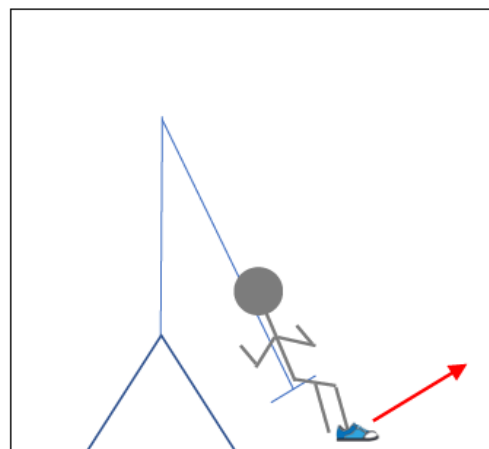


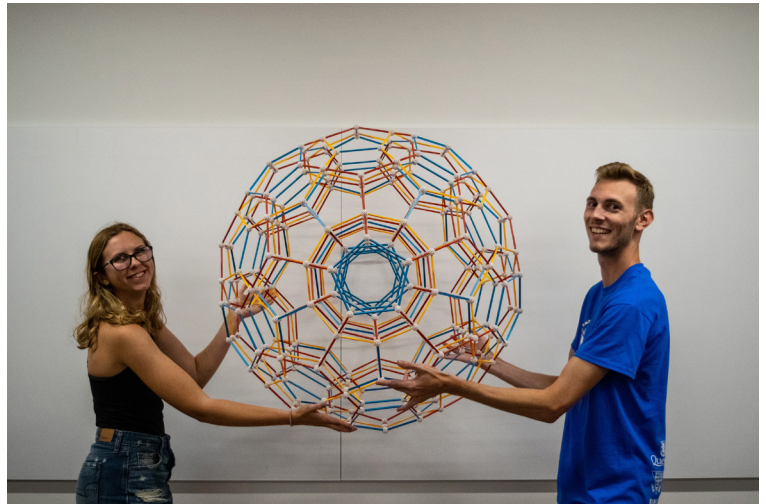
Diagram by Adam Pukier, Math & Engineering, 2021 ▲

CANADIAN UNDERGRADUATE MATHEMATICS CONFERENCE (CUMC)

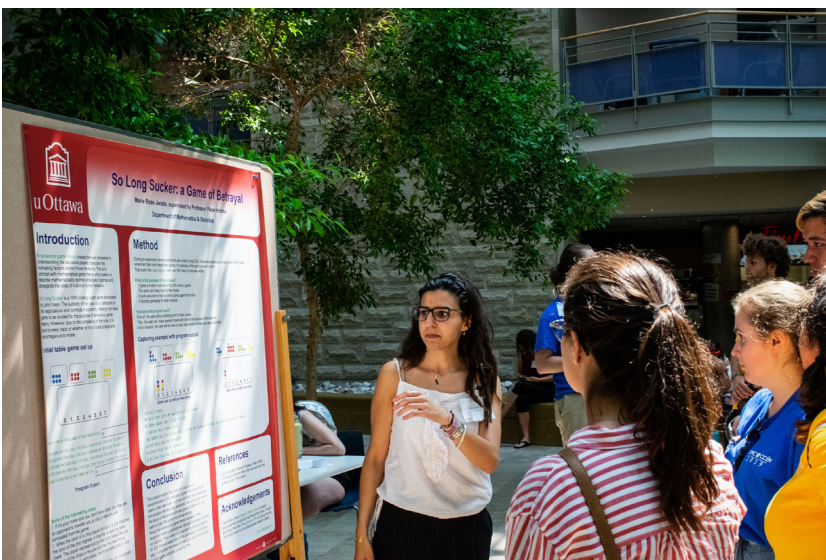
Queen's Campus, Summer 2019

Building the 120-cell

Mike Roth led this workshop in which the students constructed a “most symmetric” four-dimensional polyhedron known as the 120 cell. You might recall that in 3-space there are five “most symmetric” polyhedra and these are the five Platonic solids. It turns out that in 4-space there are also five such polyhedra and one of these is the 120-cell. It has 120 3-D faces all of which are dodecahedra. Of course, what the students built was a projection of this awesome object into 3-dimensions and you in fact are looking at a 2-dimensional projection of that.



Maddie Decarie and Matt Spragge ^



The Poster Session

Pictured is Marie Rose Jerade talking about the game [So Long Sucker](#), a game co-invented by John Nash. The idea was to design a game that as closely as possible mirrored the kinds of “games” we play with one another in our personal and professional lives. For example, failing to keep a promise is one of your strategic options. Later in the program she co-led a game-playing session with Stefanie Knebel.

The Diversity Panel

Three members of our Department participated in this 6-person panel discussion on the different ways in which diversity enriches our professional lives. From the left, Tanner Kotsopoulos, Partner Development

Manager at Microsoft, Stefanie Knebel, PhD student in biomathematics and neuroscience, Giusy Mazzone, a new member of faculty in mathematics and engineering, and Marnie Landon, standing, Emerging Technology Strategy and Project Management at C 2 Infinity Corporation, who also gave a talk on what life is like in the artificial intelligence world. Behind the speaker is Ayse Sahin, Chair of the Department of Mathematics and Statistics at Wright State University in Ohio, and next to her is Francesco Cellarosi of our Department who studies many flavours of dynamic systems. Seated at the small table are Lena Malizia-Kelly and Chelsea Crocker of the Organizing Committee.



The Closing Banquet



THE SECOND ANNUAL L. LORNE CAMPBELL LECTURE

The second annual [L. Lorne Campbell Lecture](#) was held November 27, 2019 and the speaker was Olgica Milenkovic a professor of Electrical and Computer Engineering at the University of Illinois, Urbana-Champaign, and Research Professor at the Coordinated Science Laboratory. Her research interests include coding theory, bioinformatics, machine learning and signal processing. In her lecture she talked about the problem of reconstructing whole DNA sequences when you are given large number of randomly obtained DNA fragments.



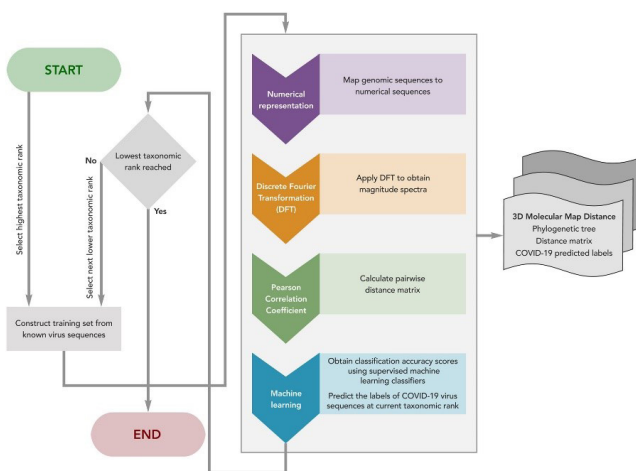
Photo courtesy of Francesco Cellarosi



FIELDSDAY@QUEEN'S

On Tuesday, Nov. 19, 2019, The fields Institute and Queen's hosted a FieldsDay@Queen's celebration with a Public Lecture by Lia Kari on Machine Learning and the Mathematics of Genomes.

[Professor Kari](#) is Professor and University Research Chair in the School of Computer Science at the University of Waterloo. Kari is regarded as one of the world's experts in the area of biomolecular computation—using biological, chemical and other natural systems to perform computations. In 2015 she received the Rozenberg Tulip Award for the DNA Computer Scientist of the Year, awarded at the 21st International conference on DNA Computing and Molecular Programming, Harvard University, for her contributions in advancing formal theoretical models and exemplary leadership in the field. The award is presented by the International Society for Nanoscale Science, Computation and Engineering, ISNSCE, annually and recognizes a prominent scientist who has shown continuous contributions, pioneering, original contributions, and who has influenced the development of the field.



Dr. Kari's talk was completely fascinating. First of all, in the same way we use the twenty-six letters of the alphabet to write text, and the two bits 0 and 1 to write computer code, the four basic DNA units (Adenine, Cytosine, Guanine, Thymine) are used by Nature to encode information as DNA strands. Theoretically, a DNA strand can be viewed as a "word" over the four-letter alphabet {A; C; G; T}, and the mathematical structure of such words has implications for their biological structure and function.

Her presentation described the research of her team into the mathematical properties of genomic DNA sequences by exploring the connection between word frequencies in a genome and the type of organism that the genome belongs to. In particular, she described their investigation into the "Chaos Game" Representation of a DNA sequence as a potential "genomic signature" of its species. In particular, we learned how they are able to combine supervised machine learning techniques with such genomic signatures for ultra-fast, accurate, and scalable algorithms for species identification and classification. The potential impact of such alignment-free universal classification algorithms could be significant, given that 86% of existing species on Earth and 91% of species in the oceans still await classification.

The session was followed by a lunch and a structured networking session for those in attendance.

ALUMNI

MARK GREEN

APPOINTED PROVOST AND VICE-PRINCIPAL (ACADEMIC)

Professor Mark Green is a 1987 Mathematics and Engineering graduate. He obtained his PhD at the University of Cambridge and then returned to Queen's as a postdoctoral fellow in Civil Engineering, becoming full professor in 2001. In March 2020 he assumed the position of [Queen's Provost and VP Academic](#).

Mark is an international research scholar in structural engineering with work that focuses on enabling structures, such as bridges, to withstand extreme conditions; his more recent interests centre around sustainable engineering technologies.

He champions multidisciplinary approaches to academic endeavours and has been cross-appointed to both the Department of Mathematics and Statistics and the Faculty of Education.

A member of the Mohawks of the Bay of Quinte, Mark has an active interest in encouraging and supporting diversity and inclusivity throughout the university. He was the co-chair of the Queen's Truth and Reconciliation Commission Task Force, as well as an advisor to the Principal's Implementation Committee on Racism, Diversity, and Inclusion (PICRDI). He is also an advisor to the Dean of Engineering and Applied Science on the development of an Aboriginal Access to Engineering Initiative, previously served as Co-Chair of the Aboriginal Council of Queen's University and as Chair of the First Nations Technical Institute.



UNDERGRADUATE AWARDS

JAMIE LINSDELL

UNIVERSITY MEDAL IN MATHEMATICS AND ENGINEERING

Awarded to the student with the highest Grade Point Average for all courses of third and fourth years.

I was drawn to Mathematics and Engineering in first year mainly because I enjoy learning how things work, and I figured a strong background in math would be a great basis for understanding the world. Looking back, I cannot see myself having gone into any other discipline. The Math and Engineering program pushed me to learn topics I never could have imagined and has given me confidence in my ability to solve tough problems and teach myself highly challenging material. Post-grad, it is unlikely I will be using the level of math that I have learned in the program, but I would say that Apple Math has developed my natural curiosity further and given me the tools to explore new topics and ideas on my own.

The world has entered a difficult period in time and there are so many issues that need to be addressed. From the COVID-19 pandemic, to the Black Lives Matter movement, to the ever-present threat of climate change, or to the issues stemming from the ubiquity of data collection and machine learning, my class has a lot of problems and challenges to think about. With respect to the more scientific and objective issues, I think our experience in Apple Math will serve us extremely well. For some of my class, it might help us work on actual solutions to these problems; for others it will, at minimum, help us to think about them more deeply. With respect to social issues, we have an important obligation to make changes on a personal level and hold our friends, family, and co-workers accountable.

At the end of the summer, I will be starting work at the management consulting firm Bain & Company as an Associate Consultant. I have always been interested in business, and consulting provides an opportunity to look at businesses in a broad range of industries and functions – learning how they work and how they make their strategic decisions. I am looking forward to applying the problem-solving skills that I have developed in engineering to a new set of challenges.

The last four years at Queen's have been the most fun, challenging and formative years of my life. Queen's, and especially Queen's Engineering, has a perfect balance between rigorous academics and a supportive culture. My peers are smart and extremely hard working, while still being down-to-earth and sociable; they are the reason this culture has perpetuated. This is exemplified in the ability to walk into the Apple Lounge and discuss course material with anyone in the program or have one of your friends drop whatever they're doing to explain a concept to you the night before a midterm. Needless to say, it is bittersweet to be leaving Queen's. On the other hand, I won't mind living in a house with more than one working burner on the stove.



JONATHAN BRYAN

ANNIE BENTLEY LILLIE PRIZE IN MATHEMATICS

Awarded to the graduating student in the program of Mathematics and Engineering who has the highest average on courses in Mathematics in final year.

Approaching the end of high school I was conflicted between enrolling in an Engineering or a Mathematics program. My math teacher informed me about the Applied Mathematics program at Queen's University and I instantly knew it was right for me. Apple Math was the perfect balance. It enabled me to explore mathematics courses as a primary focus, yielding a deeper understanding through its rigorous first-principles approach.

In parallel, the engineering courses showcased the value in simple but effective designs to otherwise complex problems. These complemented one another giving me an appreciation for all the innovation involved with the design of today's technologies. The professors not only showed me the value in the content I was learning, but also the beauty behind it. As well, I feel that the Apple Math program ensures students learn not only the fundamentals of the Engineering and Mathematics courses, but also a robust foundation of problem-solving skills that are transferable to almost any field.

This fall I am continuing my time at Queen's pursuing a Master of Science to further my journey in mathematics. I want to build on my undergraduate experience, learning interesting and fulfilling topics. Queen's has truly fostered my passion and I hope that I can keep that feeling throughout my career. I believe that the world will always have a place for passionate people striving to apply their skills and I hope to one day be in a position so that I can extend that same appreciation for the beauty in math to the next generation—following in the footsteps of the professors at Queen's.



Jonathan with Abdol-Reza Mansouri ▲

CLAIRE SMITH

MEDAL IN MATHEMATICS AND STATISTICS

Awarded to a graduating student who has demonstrated academic excellence in an honours degree who has achieved the highest standing in a Plan offered by that Department.

THE IRENE MACRAE PRIZE IN MATHEMATICS AND STATISTICS

Established by Margaret Crain in memory of Irene MacAllister MacRae, Arts '14, who was vice-president of the Mathematical Club while at Queen's.

Finding my way toward biology and math

Truthfully, I hadn't expected to major in math. I loved biology – but I loved everything, and I knew if I just did a biology degree I would miss the creative problem-solving I'd found in my math and physics courses. Over the next two years, I majored in biology, then chemical engineering, then physics before I realized that biology and math were where I belonged. Two courses were key to this revelation: a zoology course which toured the weird, fascinating branches of life, and a linear algebra course which changed how I thought about math.

Math 212 was my first true introduction to math at Queen's – not just the content, but also the community of collaboration and support among students. Math 212 was a proof-based course and I had never written a proof in my life. This was a hard transition for me and I don't think I could have made it through without the support of friends I met in the course, spending many a weekend with me going over problem sets in the basement of Jeffery Hall.



This has held true for my entire degree – my best memories of math at Queen's have been the late nights working through old exams with friends, piecing together content around a chalkboard, or talking over problem sets at those round Jeffery basement tables.

What's next?

Next fall I will be at Queen's to start an MSc in Biology, modelling the evolution of plant reproductive strategies, co-supervised by Dr. Troy Day (Math & Stats) and Dr. Jannice Friedman (Biology). Broadly, I'm interested in game theory, dynamical systems, and the diverse, fascinating strategies plants have developed to propel their genes to the next generation.

Beyond biology and math

Outside of biology and math, I enjoy spending time outdoors (cross-country skiing, hiking, identifying plants) and a good book (especially biographies, science fiction, or fantasy). This summer, I've been exploring some of the hiking trails around Kingston and learning how to rock climb with the help of some patient friends.

ENGINEERING STUDENTS TAKE THIRD PRIZE AT THE CANADIAN ENGINEERING COMPETITION



Queen's Engineering and Applied Science students placed third in the prestigious 2020 [Canadian Engineering Competition](#), which took place in Winnipeg, Manitoba in March. The national competition brings together over 200 undergraduate engineering students across Canada to compete in eight categories that challenge them to solve complex problems.

The annual competition is by invitation only, with selected teams having to first win their school competition and achieve a top performance at a regional competition. The team of (L to R) Joseph Grosso (Mathematics and Engineering) Andrew Farley (Computer Engineering), Kyle Singer (Engineering Physics) and Andrew Fryer (Computer Engineering) won the Queen's Engineering Competition and placed second at the Ontario Engineering Competition to qualify for the Nationals.

Competing in the programming category, the team was tasked with simulating a drone recreating a 3-D structure from coloured blocks that had been scattered. Restrictions, such as limiting which blocks the drone could see and the number of blocks held at a time, added to the complexity of the problem.

Andrew Fryer says that Queen's approach to learning prepared them well for the challenge. "It was a difficult engineering problem that required design skills, but also coding and communication skills." Andrew notes that the Faculty's quality of teaching was vital to their success. "Our professors prepared us well to think through the challenge and to follow a successful design process," he says. "Along with technical skills, they are teaching us the critical thinking skills that engineers need to solve problems in the world today."

SARAH BABBITT WINS THE BEST STUDENT PAPER AWARD AT THE IEEE MEETING 2019

Sarah is a 2020 graduate in Mathematics and Engineering. After her third year at Queen's, she completed a 16-month internship with Defence Research and Development Canada, in Ottawa. Working under the supervision of Dr. Bhashyam Balaji, she had the opportunity to contribute key components and framework design to the Python State Estimation and Modelling Library (pystemlib). This library is being developed to become a complete state estimation, image processing, and tracking resource for researchers in many fields – both in military and civilian applications, ranging from applications such as air and sea surveillance to traffic monitoring or biomedical applications.

Sarah designed, developed, and implemented a novel, statistical-based image processing technique allowing for target recognition and subsequent tracking for aircraft and drones. With DRDC, she was given the opportunity to plan, execute, and validate techniques in real-time air-craft and drone field trials.

Sarah: I thoroughly enjoyed my time at DRDC, learning and thriving in an environment presenting direct application of the engineering skills and mathematic principles I learned at Queen's, to solve real-world Department of Defence problems.

At the end of her internship, she was given the opportunity to publish and present at IEEE's [2nd International Symposium on Sensing and Instrumentation in IoT Era](#), in Lisbon, Portugal. Her paper outlined a novel statistical method for object detection from airborne sensors, and was awarded Best Student Paper. Sarah will be returning to work at DRDC this fall upon graduation, and is eager to have the opportunity to continue applying her Queen's education and skills.



PI DAY

MARCH, 14 2020 (CELEBRATED FRIDAY, MARCH 13, 2020)

Interestingly enough that was the day that classes were ‘suspended’ and then moved online. At the time we could hardly believe it. I met my class that afternoon expecting no more than 50 out of the class of 400, and there were not many more than that. I recall saying that was my last class till the fall, and someone replied “if there are classes in the Fall,” and I thought that an absurd remark.



Left to Right:
Professor Devon Lin
Ronny Rochweg
Naz Gulsen



Left to Right:
Edii Mason
Caitlin Mundy
Hannah Snetsinger
Lena Malizia-Kelly
Ellie Mehlretter

COVID-19

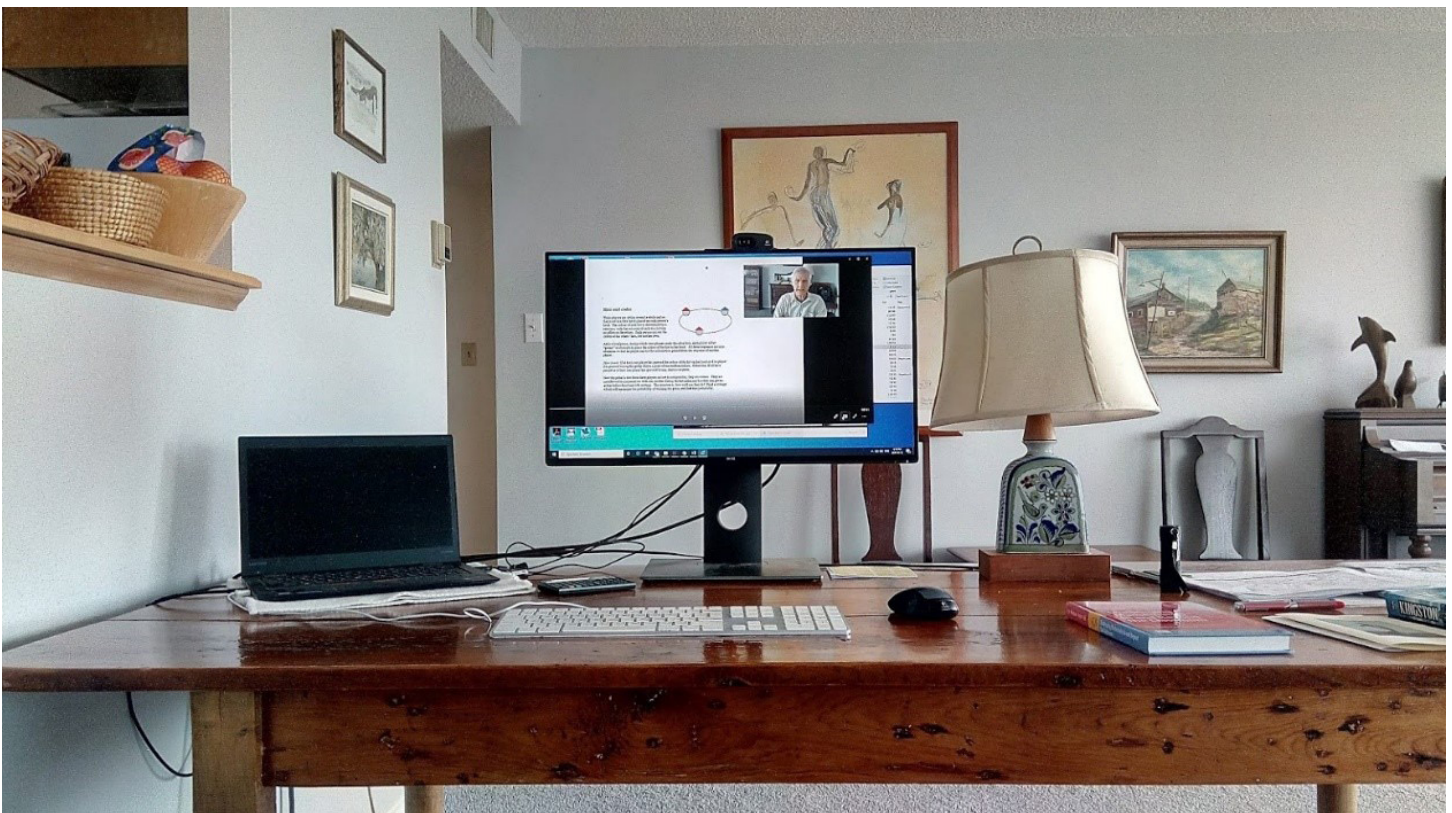
We are all experiencing the large and small ways in which this has affected almost everything we do. It has indeed had a myriad of effects, large and small, in the way the university does its work. The effects on research life are significant in some areas, particularly those which rely on laboratory work, but most mathematicians are able to carry on their research and scholarly collaboration much as usual.

But teaching is another matter. Queen's has announced that all undergraduate courses will be delivered online for the 2020 Fall semester. Also, to accommodate multiple time zones and circumstances, all lectures will be recorded for later viewing although some instructors will attempt to arrange synchronous delivery as well (for those who are free). In this regard, the university is paying close attention to issues of equity so that no student is disadvantaged through not being available at certain times, or through having uncertain internet access. Certainly a big challenge is to organize a system where students can obtain one-on-one interaction with instructors and TAs. The idea of a virtual help-centre is being explored.

Thus we are all thinking about how to engage our students and how to give them a good learning experience. At the same time we are aware of the difficulties and anxieties most of our students will surely be experiencing so we will be trying to keep things as simple and relaxed as possible, while still “having fun” with this wonderful subject.

In terms of technology, some will use tablets, some document cameras, and some will be filmed working at the blackboard. We have reconfigured a couple of rooms in Jeffery into projection rooms with computer, document camera, blackboard and one or two cameras so that the instructor can be seen.

Recording lectures from home—the way forward?



IN MEMORIAM

COLIN BLYTH (1922-2019)

Colin Ross Blyth, Emeritus Professor of Statistics, died on August 22, 2019 at the age of 96.

He was a quiet gentle man with diverse scholarly interests.

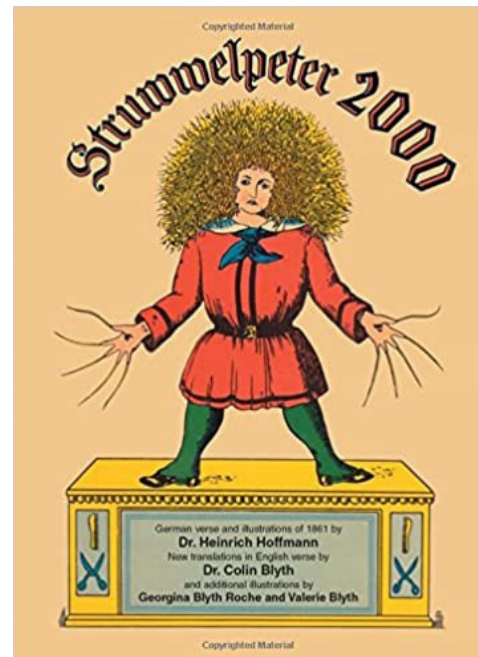
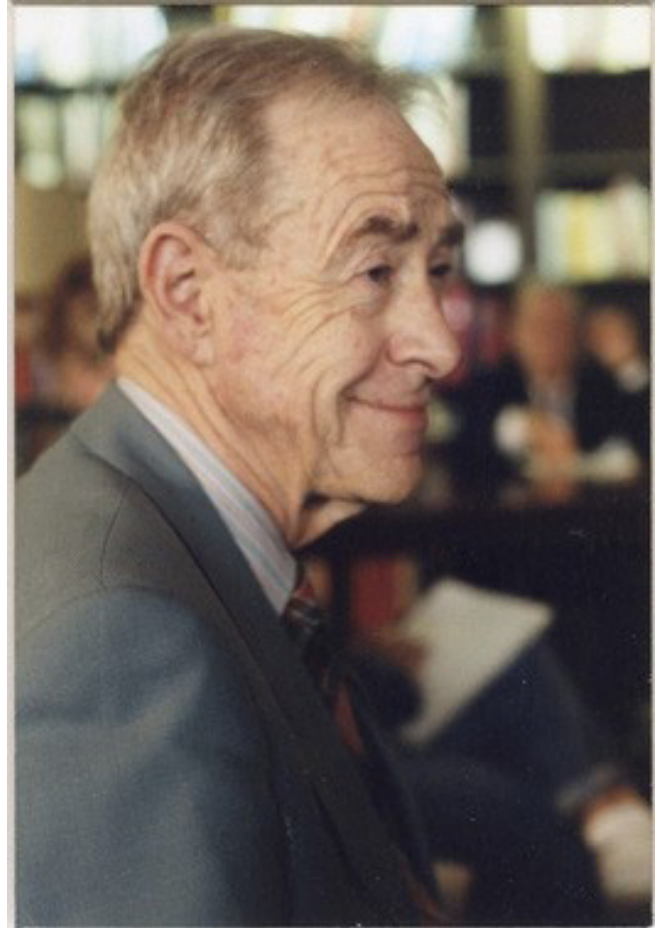
Lorne Campbell recalls: Colin used to drop in to my office late on some Friday afternoons to chat. As you know, he was a man of few words. He used to tell me of his progress in translating some German folk tales. He was a piper at one time. I think he played with the Rob Roy pipe band.

Indeed Colin left behind, in the Department, a copy of a fascinating book:

[Struwwelpeter 2000](#) – German verse and illustrations of 1861 by Dr. Heinrich Hoffmann. New translations in English verse by Dr. Colin Blyth and additional illustrations by Georgina Blyth Roche and Valerie Blyth.

In fact this is quite a remarkable book. Heinrich Hoffmann was a Frankfurt physician and wrote this book in 1844 as a Christmas gift for his three-year-old son. He put it together from funny stories that he used in his practice. He told these to frightened child patients, making pencil sketches to illustrate, and the children quickly forgot their fears and could be examined. It is sometimes theorized that the stories are too frightening for children, but Hoffmann knew better - from practice.

The book was published in October 1845 and was an immediate and perennial success. Edition after edition quickly followed - nearly 200 in Hoffmann's life-time. [from the [Amazon Review](#).]



OPPORTUNITIES FOR SUPPORTING THE DEPARTMENT

There are lots of quite interesting opportunities for participating in the life of the Department by making a gift. And it's easy. Go to the Office of Advancement's secure website:
www.givetoqueens.ca/mathstats



DEPARTMENT OF MATHEMATICS AND STATISTICS

Queen's Mathematical Communicator
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