QUEEN'S MATHEMATICAL
COMMUNICATOR

SUMMER 2017

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

WELCOME FROM THE HEAD, JAMIE MINGO

I have just completed my first year as the new Head of Department. It has been a busy year meeting and working with our campus partners, but also it has given me much opportunity to reflect on the programs we offer our students and the roles mathematics and statistics play in the University as a whole. Everybody is familiar with the 'unreasonable effectiveness' of mathematics and statistics in the construction of the mathematical models necessary to describe the physical world. There is also the creative side of mathematics and statistics that deserves to be better known. By this I mean the constructions and theorems that we create just for their simplicity and intrinsic beauty.

This year we have been preparing a self-study document that will be part of the Queen's University Quality Assurance Process. All of our programs will be subject to an external review to assure quality and relevance. This has made all of us think of how we can improve the ways our programs change the lives of our students as well as the student experience. By continually refining and improving our programs we ensure the future of the Department. As part of this process we held a morning long Departmental retreat in May to discuss long term planning for the Department.

Our enrolments have been steadily increasing in the last few years. This is partly due to being able to hire new professors and the excellent teaching our professors offer, but also, I believe, to the general awareness of the importance of mathematics and statistics in making one's skill set future proof. Cryptographic security and the analysis of large data sets are two items regularly in the news that require significant mathematical and statistical tools to understand and implement properly.

The Head has to rely on a strong team to smoothly run the Department. In February of 2017 **Marjorie Lambert** retired as Administrative Assistant to the Department. Marge worked for the Department for 48 years, the last 32 of them as Administrative Assistant. In November of 2017 the Department held a party to recognize her long and valuable service. We have been very fortunate to hire **Claire O'Brien** as our new Department Manager. Claire has worked for Queen's for a number of years, most recently in the Provost's Office.

In 2016 **Dr. Devon Lin** took over the role of Undergraduate Chair from **Dr. Greg Smith**. The Department is very grateful to Greg for his excellent service in developing the Arts & Science undergraduate program. In the same summer **Dr. Serdar Yuksel** became our new Graduate chair, taking over from me. Serdar has implemented our new qualifying exam for the PhD program. This exam will help bring our PhD students all to the same level before starting the research side of their studies. The Department is very grateful to **Dr. Ivan Dimitrov** for agreeing to serve another term as Associate Head, and to **Dr. Abdol-Reza Mansouri** for continuing his excellent service as chair of the Math and Engineering program. Also, thanks are due to **Dr. Michael Roth** who served as Acting Associate Head for 2015-16.

I am sorry to report the resignation of **Dr. Serban Belinschi** in 2015. Serban has moved to the Institut de Mathématiques de Toulouse where he is a Directeur de recherche with the CNRS. I am very happy to report that two new members of faculty have joined the Department, **Dr. Thomas Barthelme** in July 2016 who works in geometry and dynamical systems and **Dr. Felicia Magpantay** in July 2017 who works in mathematical biology and dynamical systems.

DEPARTMENT NEWS

Troy Day elected Fellow of the Royal Society of Canada, 2016

TROY DAY has been elected Fellow of the Royal Society of Canada in 2016. He was recognized for his interdisciplinary contributions to mathematics and the life sciences, particularly in the area of evolutionary theory. His analyses of a diverse array of topics – including the evolutionary biology of infectious disease and the evolutionary consequences of antimicrobial drug treatment – have greatly advanced our understandings of these subjects.

Troy did his PhD at Queen's in 1998 winning both the 1999 NSERC Doctoral Prize and the 1999 Canadian Applied and Industrial Mathematics Society Doctoral Dissertation Award for his work combining evolutionary behaviour and control theory. He went on to a Killam Post-doctoral Fellowship at UBC, and came back to Queen's in 2002 as Canada Research Chair in Mathematical Biology.

While at Queen's he won a 2004 Chancellor's Research Award, the 2005 Steacie Prize, and a 2008 Steacie Fellowship. In 2013 he was awarded a Queen's Prize for Excellence in Research and in 2015 he was won one of the six Canada Council Killam Research Fellowships awarded that year.

Troy has co-written two major text books, one on mathematical modeling, now generally regarded as the major biomathematics text in the world and another that is a major revision for life-science students of James Stewart's internationally adopted calculus text.

Mike Roth makes full Professor in 2017

MIKE ROTH graduated from Queen's in 1993 and went on to do a PhD at Harvard and a postdoc at the University of Michigan from 1998-2002, including a year in the middle as a visitor at the Max Planck Institute in Bonn. We were lucky enough to get him back at Queen's in 2002. In the meantime, he has also been a visiting professor at the University of Roma III (2007-2008) and at the Humboldt University in Berlin (2014). He is interested in Algebraic Geometry and its interactions with other parts of Mathematics, in particular its connections with Number Theory, Topology, and Representation Theory. Here he is shown with two of his graduate students **Ilya Smirnov** and **Esme Tremblay**.

I have an interesting memory of Mike from his time as a student in my math explorations course 382. One of the problems we spent some time on was to show that an odd prime p is the sum of two squares exactly when it is equivalent to 1 modulo 4. There are many ways to tackle this problem, but I choose a route that has the students revisiting a number of areas, for example, modular arithmetic, group theory, and factorization theory. One of the hard connections is to show that if –1 has a square root modulo p, then it is a sum of squares. I usually do this by looking at p in the Gaussian integers and invoking factorization theory. But Mike and a fellow student Ondreij (a visitor from Europe) went off and found an elegant and elementary direct geometric proof! Ever since that time I have always shown it to my students to raise their eyes to the possibilities of undergraduate life.

Peter Taylor

DEPARTMENT NEWS

THE FRANK KNOX TEACHING AWARD

WINTER 2017

CHUCK MOLSON came to us in 2000 having just retired from a teaching career at St. Lawrence College. At the time he probably had no idea he'd still be fully engaged in the life of this department 17 years later. He began with the introductory statistics course for the mechanical engineering students but this quickly grew to a full-time load and this coming academic year he will be teaching STAT 263 for the 50th time! His courses have always received rave reviews and he received the W. J. Barnes Teaching Award in 2010/11. "Teaching at Queen's," he says. "in a wonderful department with generous colleagues, has been and continues to be a huge blessing in my life."

NEW CHAIRS

DEVON LIN is the new Chair of Undergraduate Studies.

SERDAR YUKSEL is our Coordinator for Graduate Studies.

ALAN ABLESON assumes part time position at FEAS In 2017/18, the Engineering and Applied Science Faculty (FEAS) is rolling out an updated curriculum for all its first year courses. While the changes in the core mathematics are, as you might expect, fairly modest, other parts of the first-year experience are changing more substantially. In their programming and experimentation courses, first-year Engineering students will now be learning to use Arduino boards and MATLAB for data collection; the study of geology will be broadened to include concepts of the biosphere and connections between biology and engineering. Some instructors are also taking the opportunity to revitalize their teaching style, like the civil engineering team trying out a student-activity-based teaching style for the engineering mechanics course. Alan has been appointed by FEAS to help shepherd these projects and work with this motivated team of instructors and staff through all the steps necessary for a smooth roll-out for Fall 2017.

text

WE WECOME TWO NEW MEMBERS OF FACULTY

One of our big challenges as a department is that we are understaffed. High student-faculty ratios are a problem for almost everyone in the university, but Math & Stats, as a result of high student growth and many recent retirements, is "off the charts" in any department-wide data set. Fortunately, over the past 4-5 years we have been getting new faculty appointments at a rate of almost one per year. Two of these have occurred since the last *Communicator*.

THOMAS BARTHELME was appointed Assistant Professor on July 1, 2016. Before coming to Queen's, Thomas received his PhD in Mathematics from Strasbourg University and followed that with a post-doctoral fellowship at Neuchâtel. He was appointed a Norbert Wiener Assistant Professor at Tufts University and then an S. Chowla Research Assistant Professor at Penn State.

His research interests are in geometry, both metric and differential, and in dynamical systems, in particular hyperbolic ones, i.e., those that exhibit some strong chaotic behavior.

In his spare time, Thomas used to like rock climbing, bouldering and hiking, and intends to get back to it once he figures out the whole parenthood thing, or once his baby leaves for college, whichever comes first.

FELICIA MAGPANTAY was appointed Assistant Professor on July 1, 2017. Born in Metro Manila, Felicia left the Philippines to study Physics and Mathematics at Trent University with the aid of a Trent International Program scholarship. She then went on to do an MSc at Western and a PhD in Applied Mathematics at McGill. Following that she was a postdoctoral fellow at York and then at the University of Michigan before gaining a faculty position at University of Manitoba in 2015. Her main fields of study are differential equations (especially delay differential equations), dynamical systems, and numerical analysis, with a particular focus on mathematical modelling of infectious diseases.

Outside of mathematics, her interests include dance and reading English classics.

MARGE LAMBERT RETIRES...

MARGE LAMBERT

…in 2017 after more than 48 years in the Department. Marge took over from the formidable Eileen Wight as the Dept Administrative Assistant in 1984. Starting with Lorne Campbell she successfully steered 7 Heads (L. Campbell, L. Jonker, E. Campbell, R. Erdahl, P. Taylor, R. Murty, and J. Mingo) and at least a couple of Acting Heads through their paces, and at the same time hired and nurtured a highly effective office staff. A full-page article on Marge, written at the time of her University Staff Recognition Award, can be found in the previous *Communicator*.

WE WELCOME OUR NEW DEPARTMENT MANAGER

Hello! I'm Claire O'Brien, I joined the Math and Statistics Department in December 2016. I took over as department manager from Marge Lambert, who is now enjoying a well-earned retirement. I'm happy to be here and learning all the time. I've come to the department through a slightly circuitous route. Originally from the UK, I took a degree in French and German language and literature, then joined the police force in London. I left the police a few years later to join the civil service, and worked on issues from early childhood education to immigration, by way of drug treatment in prisons. I ran the private offices of two Government ministers and burned the midnight oil in the surreal surroundings of the House of Lords.

Then in 2005 my husband and I moved to Canada, enjoying 6 months travelling around the world on the way. Here in Kingston I've gained a college diploma in behaviour therapy, had two lovely children and worked at Queen's since 2012. Outside of work I enjoy being outdoors, skiing, traveling, yoga and knitting. Here in Jeffery Hall I'm enjoying the variety each day brings and the chance to work with great staff and faculty members.

CLAIRE O'BRIEN

FACULTY OF ENGINEERING AND APPLIED SCIENCE FIRST YEAR TEACHING AND LEARNING AWARDS

WINTER 2016

CARLY ROZINS

Carly recently obtained her PhD in mathematical biology working with Troy Day and Peter Taylor. Her thesis developed a model for the spread and evolution of Marek's disease, a disease of poultry, especially prevalent in overcrowded industrial poultry farms. Her more recent work, funded by the Egg Farmers of Canada, aims to evaluate the economic impact of controlling virulence evolution in the egg industry. She is currently a postdoctoral fellow in mathematical biology at Berkeley, and her current work develops models to investigate how apiary structure and practices may be driving the evolution of virulence in honeybee pathogens.

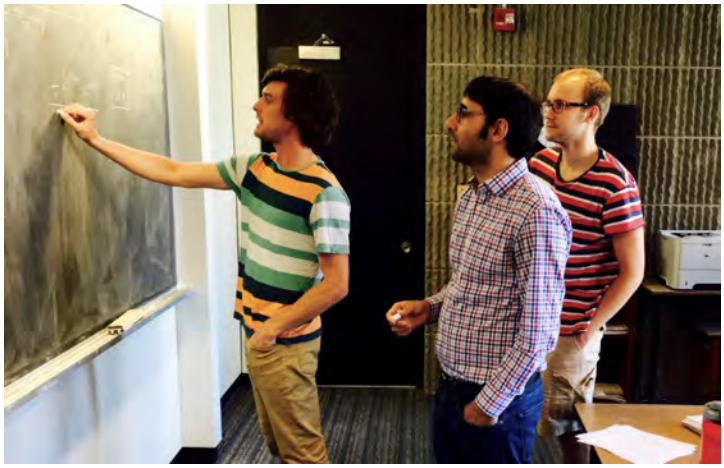
WINTER 2017

DAVID RIEGERT

David is a PhD candidate in statistics under the supervision of David Thomson, using time series analysis and signal processing tools. His research focuses on improving the models used to explain the relationship between the Earth's magnetic field and induced currents in power transmission systems. These models are used by power companies to mitigate the effects of geomagnetic disturbances caused by solar storms. His previous work in his masters looked at identifying ocean tides in the Great Lakes and examining interesting modal structure in Lake Michigan. David is also currently involved in a collaborative project to develop and improve upon models used to predict the acute health effects of air pollution in Canadian cities

BAHMAN GHARESIFARD WINS IN WINTER 2015 & WINTER 2017

Bahman first came to Queen's in 2005 to study with Abdol-Reza Mansouri having just obtained an MSc in Control and Dynamics from Shiraz University, Iran. After his Queen's PhD, he held postdoctoral positions in Mechanical and Aerospace Engineering at UC San Diego (2009-2012) and with the Coordinated Science Laboratory in Urbana-Champaign (2012-2013). Following that we were lucky to get him back here as an Assistant Professor. His research interests include distributed control and optimization, social and economic networks, game theory, geometric control and mechanics, and Riemannian geometry. This is the second time he has won this award.



BAHMAN GHARESIFARD with two of his MASc students, Jeremy Coulson (at the board) and Drew Steeves.

QUEEN'S APPLE MATH STUDENT – SIOBHAN POWELL

adapted from a Faculty of Engineering and Applied Science article April 8, 2016

Siobhan is the speaker at our 50th Anniverary of Math & Engineering event on Saturday October 14, 2017 at the University Club.

Siobhan will start grad school at Stanford in the fall. She'll be working on research into mechanical applications in renewable energy.

"The strong mathematical, analytical background I developed in Apple has allowed me to pursue more unique and ambitious projects in my Graduate Studies in Mechanical Engineering than I could have ever imagined attempting otherwise. I didn't plan on grad school when I first came here. I remember, in first year when we had to choose our streams, specifically asking people about Apple Math: 'Do you have to go to grad school or can you go directly into industry?' because that's what I thought I wanted to do."

After second year, she took a summer job in corporate finance. Powell recalls the experience as an interesting challenge but one that ultimately helped her decide that business was not where her passions lay. Rather, she felt drawn to the research and development of renewable energy technologies. For the summer after third year, one of her professors **Abdol-Reza Mansouri** recommended her for a research internship at INRIA (L'Institut national de recherche en informatique et en automatique in southern France. There she worked with a group on the interpretation of data signals from MRI machines.
"I spent the first month catching up on all the literature and talking to the PhD

students about their projects," says Powell. "A three-month summer is very short but I got a taste of the lifestyle and what it's like to do research. I developed a strong interest in wave energy and tidal energy. I also learned that, for all the leading-edge jobs in that field, you need more than a bachelor's degree."

So, armed with a strong transcript and a list of researchers with similar interests, she started the application process. She applied to five of the most prestigious universities in the world, earning and settling on a spot at Stanford University in California.

WHY CHOOSE STANFORD?

"The professor is doing really interesting work and was really nice so I thought we would get along well," says Powell. "The graduate students really like him and I got better funding for Stanford than any of the other schools. That turns out to be a big factor, too."

SIOBHAN'S ADVICE

"Finally, I'd say to be ambitious. I never thought I could get into Oxford or Cambridge or these places that sound all very far away and fancy but they want people like us to go there so they'll pick us and it will be great," she says with a smile. "I wasn't very confident applying to these places and I should have been more so. So be ambitious."

50 YEARS
Mathematics and Engineering
QUEENS UNIVERSITY

MATH9-12

By Peter Taylor

PROJECT MATH9-12 is part of the KNAER Mathematical Knowledge Network (MKN), an initiative of the Ontario Ministry. Our objective is to construct problems and activities for the high school math curriculum that engage the students in what we call mathematical thinking—something many of our first-year students seem to have very little experience of. There are a number of hallmarks of this kind of thinking, all the way from clear and careful reasoning ability to the capacity to work with sophisticated structures.

In this regard we borrow a practice routinely found in the creative arts and humanities in which the works of art brought into the classroom are often at a higher level of sophistication than the students themselves could work at. For some reason this is almost never seen in the math classroom.

Math9-12 is in its second year. In summer 2016 we ran a camp for grade 9-10 students to workshop a grade 10 activity and then in the 2016-17 school year we tested it in two KCVI classrooms, each for two weeks. In one of these, three of my graduate students (see below) played a research role documenting classroom activity and interviewing the students and teacher at the end. To prepare for this they took courses in quantitative and qualitative research methods at the Faculty of Education. Our ongoing work is the development and class-testing of new investigative problems.

*A picture from our Grade 10 math Camp in 2016. The students are studying linear transformations using a GSP app constructed by **Suzanne Findleton**. One of the Math9-12 tutors, **Grushenka Ramhota**, is seen standing behind the table.*

On Aug 28, 29 and 30, 2017 we ran professional development workshops for high school teachers in Kingston, Ottawa and Toronto.

> Mathematics is the abstract study of structure. Students who are able to think in structural terms have greater access to powerful ideas.

DIVYA LALA, MSc math education

STEF KNEBEL, MSc game theory

KARIANE OUELLET, MSc math education, BEd candidate

OUTREACH: MathQuest

By Siobhain Broekhoven

MATH QUEST is our national summer residential program that runs each August for 4 days. Sponsored by the CMS, it is designed to encourage (high school aged) young women to pursue mathematics and other STEM fields. We make connections between mathematics and other sciences, the visual arts, dance and music. Programing changes each year. Now in its 4th year of operation, we have had girls coding in RobotC in the ILC, run an experiment using stereomicroscopes in the Biosciences Complex, and use the Agnes art studio for paper folding and centre-of-mass sculpture. We have used the Isabel to explore math using dance. Last summer our instructors designed an Escape Room in Jeffery Hall. The project gives our graduate students opportunities for teaching and program design, and is funded through the Math Camp Fund. For more information please go to www.mathquest.ca or phone 613 533 3254.

Here is some feedback that we have received from return campers.

From applications to Math Quest 2017:

"In the past years it has been a really positive learning environment and I met many new people. We also played really fun games that I have never played before. I also look forward to further developing my skills in mathematics and improving for the future."

"I really enjoyed the escape room activity because it allowed for me to problem solve with other people and finally get all the clues in order to solve the final solution."

"Learning math along with like-minded individuals and furthermore math that I don't usually have the opportunity to learn in school is always a refreshing and interesting time. I also really like the campus setting of Queen's with the water and beautiful old buildings. Math Quest helps to spark my curiosity to explore mathematics, which is a passion often dimmed by school. The freedom to explore encourages my future pursuing in the world of math and I hope to develop this interest. Finally, I have also made many friends in Math Quest, and I hope to meet many more!"

An excerpt from the personal statement of a university entrance application:

"Math Quest has made me feel like I have a place, and a responsibility to push myself to the limits of pursuing my potential. I hope one day to become one of these powerful educated ladies, and spark as flaming a fire in the hearts of those like me."

Escape Room designers: *Mike Cabral, Carly Rozins and Grushenka Ramhota*

An email from a parent:

I have been meaning to write to you for some time to let you know how much I appreciated the effort you and your team gave to Math Quest 2016. My daughter attended the day program, she is 14. It is at times difficult to impress a teenager but she expressed that Math Camp was "amazing" and "so much fun", "best camp she has ever experienced". She loved the interaction, the activities all over campus, the fun and engaging ways to use math and enjoyed cryptography most of all. She was excited after each day and eager to share her experiences. I really just wanted to say thank you. As a parent, it was wonderful to see her so inspired. She is now in Grade 9 and has joined her high school's "mathletes" club. She will definitely be participating in next year's camp.

It must take an enormous amount of planning, time, effort and hard work to offer a summer camp such as Math Quest and I thought I should let you know that all your efforts are very much appreciated.

Math Quest participants at the Isabel Bader Centre for the Performing Arts Summer 2016

OUTREACH: SHAD 2017

By Peter Taylor

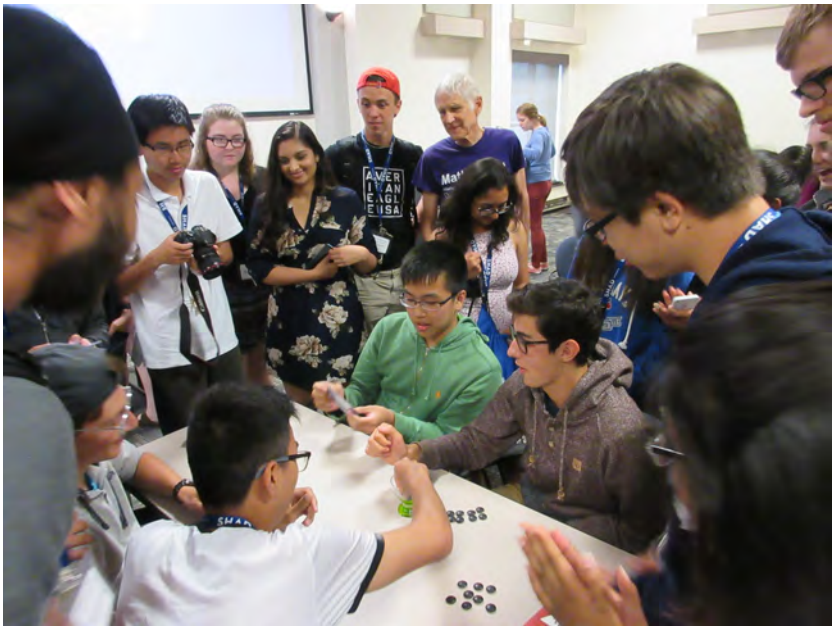
In July we spent a morning with the SHAD high school students who spend a month at Queen's every summer. They are a collection of 56 top high school math students from all over Canada—28 girls and 28 boys—and we organized the students into 28 teams of 2, 14 teams of girls and 14 teams of boys. This year we played "RedBlack," a version of prisoner's dilemma. This is a 2-player game and for us, a "player" was a team of two. Each team is given two cards, one black (B) and one red (R). In each play of the game each team selects one of the two cards and places it face down on the table (so that the opponent team cannot see the colour). When both cards are down, they are turned over, and the payoffs are determined by the matrix:

	B	R
B	2	1
R	3	0

MICHAEL CABRAL *seen leaning in to watch students negotiate, will be teaching Evolutionary Game Theory (MATH 339) in Winter 2018.*

The entries of the matrix are the payoffs to the row strategy against the column strategy. Thus if both teams play Black they both get 2 points, and if they both play Red they both get 0. If they play different colours, the Red team gets 3 points and the Black team gets 1. You can see that R is a more aggressive and riskier move than B.

We designed a tournament in which in each round, teams were paired as opponents for a sequence of 10 games so that negotiation was possible and even encouraged. After each round, teams re-assorted and there were 5 rounds in which girls played girls and boys played boys, and another 5 in which boys played girls. Thus we were thinking we might find a gender effect—perhaps girls would be more cooperative in some situations than boys.



One of the play-off games

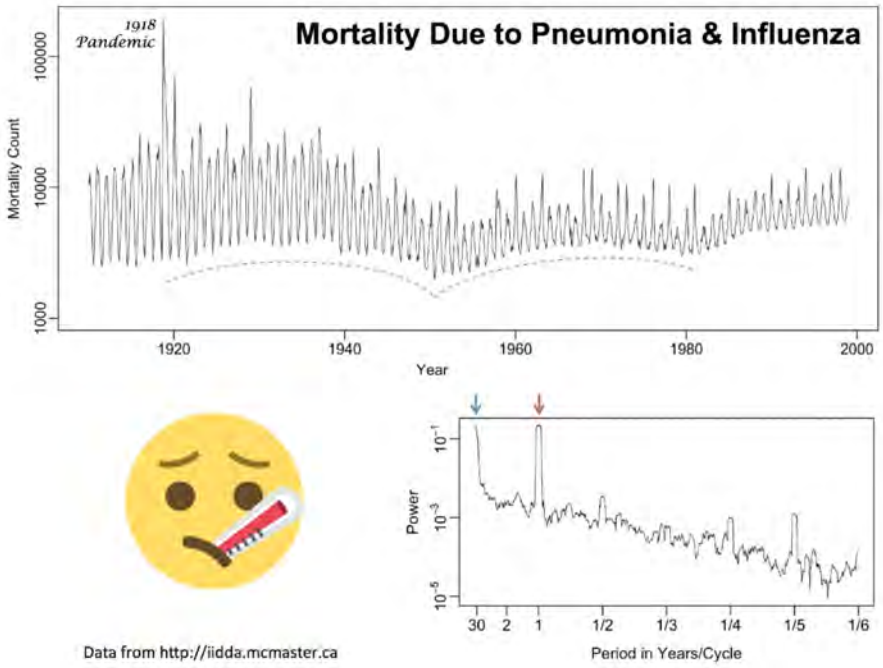
We did not find a gender effect. The girls earned a total of 2004 points to the boys total of 2003. Opposing teams negotiated to play strategies that avoided the RR outcome and the "always play B" and alternate B and R (asynchronously) were popular. The advantage of the latter one is that it is less vulnerable to cheating. Once a team cheated and trust was broken, it was difficult to recover and there were many strings of zeros.

During the research interviews with students that followed the game play and discussion of Nash conditions, several students expressed interest in our game theory course, further developed by **Dr. Andrew McEachern** in 2016. With Andrew's redesign, enrolment surged to an all time high of 170 students, causing it to be offered 3 years in a row.

THE 3 MINUTE THESIS COMPETITION (3MT)

In the 3-Minute Thesis competition (3MT) graduate students present their research and its wider impact in 3 minutes or less with only one slide to a panel of non-specialist judges. The idea originated at the University of Queensland (Australia) in 2008 but has now spread over the world. Canada has university, regional and national competitions and for each of past two years the Math & Stats Department has sent a student to the Queen's competition.

Our 2017 entry was **CLAIRE BOTELER**, an MASc Masters student of David Thomson and Troy Day. Her presentation looked for the hidden patterns in influenza outbreaks over many years. Her investigation spanned almost a century worth of influenza mortality data—the top graph in her slide. The bottom graph is what is called a spectral analysis of the data—identifying the dominant frequencies of oscillation found in the data, just like the overtones of a vibrating guitar string. As indicated by the high peaks at the red and blue arrows, this confirms that a 1-year period and a longer period around 30 years are significant. The plot also shows significant periods of half, a quarter and a fifth of a year. These shorter periods could have a biological connection, the half year period could be due to the world having 2 flu seasons, one in each hemisphere. Certainly this analysis tells us that there are interesting patterns that remain to be understood.



THE 3 MINUTE THESIS COMPETITION (3MT)

Our 2016 entry was **TRISTAN MILNE**, an MASc student of Abdol-Reza Mansouri. Tristan talked about what he called the inverse problem of Electric Impedance Tomography.

The flow of electricity through a conductive medium, like the tissues of the human body, is governed by a partial differential equation, the coefficients of which depend on the electrical conductivity of different tissues. If you know these coefficients, you can get a pretty good idea of what the inside of the human body looks like, since different structures often have very different electrical conductivities (think of bone as a poor conductor versus a muscle or nerve fiber). Now we could work out these coefficients if we knew the voltage throughout the human body. The problem is that that's difficult to measure. What we can access are the voltages on the surface of the skin and the problem then is to deduce the inside voltages from those.

Tristan is currently pursuing a PhD degree in Applied Mathematics at the University of Toronto.

NSERC Science Action Video Competition

YULIYA NESTEROVA, an MSc student of Mike Roth, entered NSERC's 2017 Science Action video competition and her video "Lives of Shapes in Space" was selected as one of the top 40 entries. The rules were that the video was about an NSERC-funded project and was no more than a minute in length. It was judged on technical quality, creativity, and clarity. In the competition window (February 2017) it was one of the top 25-most watched videos! Yuliya says: "It was a ton of fun to make and a wild adventure to promote, with help from all around. I'm really glad I entered." Give it a watch!

Yuliya has been very active in departmental life from her undergraduate years to the present. She has worked with the Department Student Council (DSC), is an organizer of the Pi-day festivities, and a long-time instructor for Math Quest, our summer program for high school girls which runs every August.

PI DAY 2017

By Peter Taylor

Every year on March 14th we celebrate Pi Day with a variety of activities including enjoying pie during a Pi reciting contest that often goes to several hundred digits. A highlight of the celebration this year was the π-jeopardy game organized by **Yuliya Nesterova**.

The "final jeopardy" problem was to decode the complex Mobius maze shown below right in order to arrive at the π symbol. The picture below left shows **Danny Rorabaugh** with his π shirt and **Richard Leyland** with his toque working on the problem. Danny is a post-doc with Claude Tardif and David Wehlau, and Richard is a PhD student with Ernst Kani.

Danny Rorabaugh and Richard Leyland

Mobius maze solving

C* ALGEBRAS, RANDOM MATRICES, PROBABILTY AND BEYOND

Conference held at Queen's Oct. 16-17, 2015 to honour **JAMIE MINGO***' s 60th birthday.*

This conference celebrated Jamie's achievements and his contributions to the Canadian Mathematics community. There was a large attendance reuniting many of his colleagues from all parts of the world, mentors and students, working in operator algebras and non-commutative probability. It provided an opportunity to represent the state of the art in those fields and to give a perspective for what lies ahead and where the challenges are.

MATHEMATICS AND ENGINEERING AFTER 50 YEARS!

At homecoming this year (Oct 13-15, 2017) the Department's Mathematics and Engineering program will celebrate its 50th anniversary and we hope that a number of past grads will be there to help us celebrate. The 50-year Logo, displayed just below, was designed by Andrew Lewis --anyone want to guess the sum of the series? Over the past few years the program has experienced steady growth, to the point where in Sept 2017 it will admit nearly 100 second-year students. These numbers are very exciting for us, but have made things challenging.

50 YEARS
Mathematics and Engineering
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To accommodate the increased numbers, the Department has hired a Program Associate, **Scott Kyle**, who has now done this job for two years. Scott's work has allowed us to offer and expand project courses in the second and third year of the program. These courses permit students to get a glimpse of the power of mathematics early on in their undergraduate career. In their second-year project course, students engage in a project where they numerically design a distributed control law for a group of robots. Thanks to the hard work of Scott, Professor Bahman Gharesifard, and summer students hired using Queen's' SWEP, the plan is to allow the students to implement their control laws on hardware within the next few years. For the third-year project course, students use Matlab to perform system identification and control design on an unknown system. Along with the fourth-year project course that students have always done as part of their degree program, this has given Mathematics and Engineering students substantial experience with design, project management, producing written reports, and giving oral presentations.

2017 GRADUATES

At both undergraduate convocations this year, photographers were out to capture our graduating classes.

Math & Engineering Class of 2017

I. Harbell, D. Kao, C. Hudson, M. McCreesh, T. Ognibene, R. Hum, L. Castelli, D. McTiernan, B. Rudson, G. Sandison
C. Savides E. Hansen

Faculty of Arts & Science Math and Stats Graduates 2017

Stuart Squires, Scott Napier, Hyeyong Park, Juliana Lebid, Tim Chan, Elise Agnor, Selamawit Desta, Akshay Gupta, Eric Sanders, Josh D'Agonstino, Laura Serafini, Andrew Grubel, Yeji Hwang,Federic Casgrain, Anny Tang, Jordan Prizant, Eric Han (Drs. Greg Smith and Peter Taylor in background)

ALUMNI

At homecoming last Fall I encountered Alumnae **Sandra Frid** (Arts '79 — Mathematics) and **Lise Enstrom** (Science '79—Mathematics & Engineering). We had tea in the Jeffery lounge and a delightful talk. I asked them what they had been up to over the past almost 40 years and what they felt that their math degrees contributed to their lives.

Lise, Peter and Sandra in Jeffery lounge

Sandra mentioned a number of capacities that she feels her mathematical education contributed to:

- for seeing the big picture while simultaneously seeing how the parts fit together
- for attending to details and working carefully.
- for curiosity and creatively
- and all these being ingredients of problem-solving.

After completing a BSc and MSc in mathematics and then a BEd (all at Queen's) Sandra taught high school in Edmonton and then went on to a University of Alberta PhD in mathematics education at the secondary level. Most of her career was spent in Australia but she talks of its richness and the wonderful "opportunity to influence mathematics learning and teaching for people of all ages and from all over the world and from many different cultures—for example, young aboriginal children, teachers in Bhutan who live in remote communities a day's walk from the nearest road, teachers from all over the Pacific-Asian region, and local teachers/learners struggling with mathematics phobia.

Lise had a rich and varied career in Information Technology, a field that of course saw mind-blowing change over those past decades. In pointing to the important part played by her math background, she said that there are of course many opportunities to use math skills directly, but equally important are problem solving and creative thinking skills. How do you see what's needed and essential when modelling a business process and redesigning it based on the use of modern technology? How do you know what is the next best step or when you might have taken the wrong path? A successful math student will have developed the knowledge and skill set needed at such times.
There is also extensive teamwork involved in analyzing and designing large systems. Communicating with and engaging participants in the process is key to the success of a large project. We were fortunate, in the late 70s and early 80s, to have small classes in which the professors could encourage group problem solving and class participation. This promoted rapid problem solving, gave the students the opportunity to express themselves, and demonstrated the way others worked through a problem. Many IT professionals will have to spend time in front of a white board and be able to think on their feet.

In one of her emails Sandra asked if we still show that crazy 1966 movie of a Texas policeman pulling over a car and using the Mean Value Theorem to prove that the driver (a college kid) must have been speeding. As I recall, every kid who took calculus in the 70's in the Jeffery theatres was made to watch that hilarious movie—made even funnier by the thick Texan drawl of the narrator. In Jeffery we had a rear projection system housed in the room behind the screens in the three theatres (126-8). We had to go into that room before the class to load the film. For anyone who wants a trip down memory lane, the film is now online: https://vimeo.com/101691769.

The Theorem of the Mean Policeman (1966)

IN MEMORIAM

TONY GERAMITA (1942 — 2016)

Tony arrived at Queen's in 1969. There were many new profs that year as John Coleman had obtaining a large grant from NRC to build up the Department and make it a serious research centre. That was also the year Jeffery Hall was opened so that the Math Dept was finally (again) all housed under one roof. It was a time of beginnings.

Tony became a full professor in 1981. In 1996 he was also given a professorship at the University of Genoa in Italy, and was a regular visitor there. In his research, Tony was the driving force behind the algebraic geometry group. He was always looking to bring people together and in 1990 he helped organize the Route 81 conference that brought together algebraists from Queen's, Cornell, and Syracuse University—an annual conference that continues today.

Tony at a dinner in Italy where he taught during the winter terms at University of Genova.

photos chosen by Dr. Joan Geramita, who started as a teaching fellow in 1969 and was Associate Professor from 1986 to 2003

His Curves Seminar was famous, almost as revered as the weekly seminar dinners that he and Joan would hold in their home for a wide group of graduate students, postdocs and faculty to discuss the world, mathematical and actual. His former student Adam Van Tuyl (now at McMaster) said: "Although I didn't realize it at the time, these dinners were unique; they provided a great opportunity to interact with my fellow graduate students and the current group of post-docs, but also to start building a research network within the larger mathematical community. They were also very entertaining, especially when Tony started telling one of his many stories."

As an adviser, Tony encouraged his students to be independent, posing questions and then providing plenty of space to work and explore on their own. He helped many students and young academics get published, collaborating on papers throughout his career. More than anything else it was clear that he cared. "Tony was a wonderful advisor, a great collaborator and friend," says former student Tai Hua Ha (Tulane). "Tony understood his students well and knew exactly when to push and when to give us more space and time. There were times when I got stuck with my thesis problem and thought of giving up, but Tony encouraged me to persevere. When I finally solved the problem, he was super happy — I knew that he was very worried about me, but he let me decide my path, and I really appreciated that."

Tony is deeply missed by his colleagues. He helped keep things together, offering a smile and his famous laugh. "Tony was the 'social glue' in the algebra group," said Morris Orzech. "He took an interest in everyone's visitors. Even if he didn't interact with them mathematically he would interact with them socially, and take charge of the social part of their visit. That is one reason we had many visitors coming back."

IN MEMORIAM

HAROLD STILL (1926 — 2017)

by Malcolm Griffin

Harold, or "Bus" as he was called by friends and colleagues, first arrived at Queen's in 1951 to do an MA in Mathematics with Ralph Jeffery. Recognizing Harold's teaching ability, Jeffery put him to work. Of these four years of teaching Harold said "I worked hard and enjoyed every minute of it."

During and immediately after his PhD in Statistics at Virginia Polytech he taught at Alfred University, rising through the ranks to be professor and Department Chair. In 1965 he returned to Queen's where he taught until his retirement in 1991.

He was the Coordinator for Actuarial Studies for ten years and worked counselling students and guiding them into appropriate courses. For five years he was the Chair for Statistics.

One of his little-known contributions to campus life was his creation and organization of the annual "Frosh Visits" whereby the Arts & Science Gael Groups attend a dinner at a professor's house to mark the end of Orientation Week.

His most notable publication was in association with Colin Blyth; their 1983 JASA "Table of Binomial Confidence Intervals" is credited by Google Scholar with a remarkable 427 citations!

Bus occasionally used overhead transparencies and he related to me how, in order to reduce the interference of the overhead light above the screen, before the first class of the year, he would reach up, unscrew the bulb and deposit it in the teacher's desk. He told me he was shocked to discover that the desk drawer was filling up with the bulbs he had deposited over past years!

Clare and Bus at ease (photo by Gill Fisher, the quiche maker)

Bus and his wife Clare were a remarkable couple, deeply committed to and supportive of each other in pursuing their passions of community involvement and friendships. Clare was well-known in Kingston, perhaps most often for the "Summer Pantry" café she ran for years behind Kingston City Hall. Bus became famous for the "Quiche Mobile" he would use to respond to urgent delivery requests.

Harold loved teaching, and after retiring, he continued to teach for about six years with appointments at Queen's, RMC and Acadia. He characterized his teaching as "endeavoring to get students to think". Harold was a devoted and much loved teacher, his students could tell that he cared deeply about them, was fully attentive to their needs and prepared to go the second mile in helping them.

IN MEMORIAM

URI FIXMAN (1932 — 2017)

by Peter Taylor

Uri did his PhD work and had his first teaching position at the Hebrew University. Following that he had research positions at Yale and Stanford before arriving at Queen's as an Assistant Professor in 1961. He was appointed a full professor in 1971. He had a sabbatical year at Urbana-Campaign in the 70's and returned for a year to the Hebrew University in the 80's. More recently, as an Emeritus Professor, he was often at the Friday afternoon colloquium. He lost his dear wife, Miriam, a few years before he died.

I encountered Uri in Fall 1962 in the first week of my second year. I was walking up the stairs in Carruthers Hall when I heard this powerful voice coming from above. I peered into the second-floor classroom and then sat at the back. Right away I was hooked—I recall feeling that I was seeing real mathematics for the first time. That's not surprising as it was Uri's Galois-theory course. I wasn't quite ready for it, but it was too good to miss.

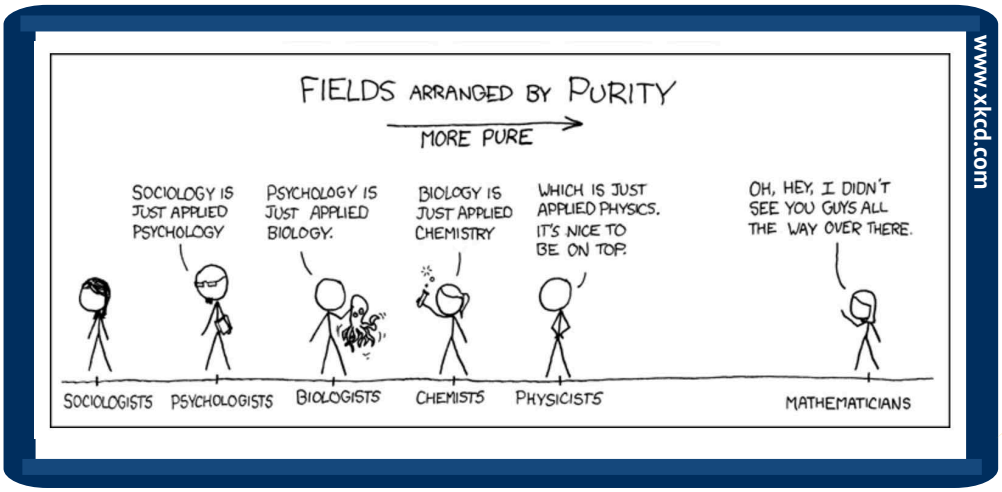
To read more about Miriam and Uri please visit the Lives Lived column on page 6 of the Gazette's first edition of the 2017-18 academic year.

BILL WOODSIDE (1932— 2017)

by Peter Taylor

Bill was born in Canada (Fort William) but moved to Northern Ireland at a young age. He took all three of his degrees in Physics at Queen's University Belfast, later earning his MSc and DSc. He returned to Canada in 1952 and in these early years taught at Ridley College in St. Catharines, taught physics at University of Toronto, worked at the National Research in Ottawa and worked briefly at Gulf Research and Development in Pittsburgh. In 1966 he begin a 30-year career at Queen's, winning at one point the Golden Apple teaching award. He served as Chair of Math and Engineering from 1980 to 1986. He and his lovely wife Sally loved to travel, and spent three sabbaticals in Oxford, Stanford and UBC.

Bill's research life was centred around problems of optimal control and Markov processes. Many of his papers reflected his abiding interest in the workings of his everyday world: If you only need to dash into the store, is it worth feeding the parking meter? How do you allocate your effort in a long race? Why do so many best-of-seven series go to the limit? The problem of the perfectly boiled egg. And finally a paper for his students on how to pass his exam with minimum expenditure of effort. He was a great fan of tennis, squash and snooker and had many fine games, either on the courts or at the "Faculty Club" with colleagues. He was a gentle modest man with a sunny disposition and a kind word for everyone. In his last years mobility became an issue, but he moved to the Simcoe Apartments downtown and was happily occupied keeping track on all the major sporting events on his big-screen TV.



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