CONGRATULATIONS

AWARD WINNERS

Sir William Young Gold Medal in Mathematics

Nathan Musoke

Waverly Prize

Erin Anderson

University Medal in Statistics

Kim Whoriskey

Emil and Stella Blum Award in Mathematics

Hayley Tomkins

Ralph & Frances Lewis Jeffery Scholarship

Nathan Musoke

Julia Tufts

Ellen McCaughin McFarlane Prize

Emma Carline

Bernoulli Prize

Chantelle Layton

Barry Ward Fawcett Memorial Prize

Clinton Morrison

Professor Michael Edelstein Memorial Graduate Prize

Lihui Liu

Ken Dunn Memorial Prize

Justine Gauthier

Heller-Smith Scholarship

Seth Greylyn

Katherine M. Buttenshaw Prize

Kelly Vanlderstine

Field Prize in Statistics

Jingchun Pei

NSERC AWARD WINNERS

    CGS – D3   *Svenja Huntemann*

    PGS – D3   *Holly Steeves*

Undergraduate Research Awards

Emma Carline (Karl Dilcher)
Ghislain d'Entremont (T. Kolokolnikov)
Nathan Musoke (Alan Coley)
Ben Potter (Richard Nowakowski)
Alyson Spitzig (Roman Smirnov)
Hayley Tomkins (Theodore Kolokolnikov)
Kim Whoriskey (Joanna Mills-Flemming)

NEW KILLAMS   *Svenja Huntemann*
                      Antonio Vargas
                      Kim Whoriskey

KILLAM RENEWALS   *Huda Chuangpishit*
                      Ali Alilooee Dolatabad
                      Chris Levy

HONOURS STUDENTS

<u>**Honours - Mathematics**</u>

Zachary Chartier (with Economics)
Ella Dubinsky (with Neuroscience)
Alaa El Masry (with Psychology)
Melanie Foerster
Chantelle Layton (with Oceanography)
Justin Mayne (with Economics)
John Mullins
Nathan Musoke (with Physics)
Travis Russell (with Computer Science)
Katherine Ryan (with Economics)
Julia Tufts (with Music)
Zhuojing Zhang (with Statistics)

<u>**Honours - Statistics**</u>

Celene Burnell (with Marine Biology)
SiYuan He
Caroline King (with Microbiology)
Moyan Mei
Thomas Minshull (with Economics)
Kim Whoriskey (with Marine Biology)
Jing Zhang (with Math)

GRADUATE STUDENTS

October 2013 Convocation:

<u>**Mathematics**</u>

Danielle Cox (PhD)
Darien DeWolf (MSc)
Svenja Huntemann (MSc)
Ethan Mombourquette (MSc)
Kira Scheibelhut (MSc)
Matthew Stephen (MSc)

<u>**Statistics**</u>

Wei Dai (MSc)

*May 2014 Convocation***:**

<u>**Mathematics**</u>

Abdullah Al-Shaghay (MSc)
Emma Connon (PhD)
Tom Potter (MSc)
Celeste Vautour (MSc)

<u>**Statistics**</u>

Holly Steeves

CHAIR'S MESSAGE
by Bruce Smith

I would like to begin with a recognition of all of our graduates. Convocation Day is a special time to celebrate your hard work and your achievements. My congratulations to all, and particularly to those of you who have distinguished yourselves through receipt of honours and prizes, as indicated above.

Congratulations to David Iron, who was recently promoted to Full Professor.

Richard Wood begins formal retirement beginning July 1. Richard completed his Ph.D. in our department and has gone on to a distinguished career as a researcher, teacher, and supervisor. I anticipate that this will be retirement in name only, and we look forward to Richard's continuing presence in the department.

Thanks to Robert Milson, who finishes his term as Director of Mathematics on June 30, and to Peter Selinger, who succeeds Robert in this role. David Hamilton, returning from sabbatical on June 30, will resume duties as Statistics graduate coordinator at that time. Many thanks to Hong Gu for carrying the role of Statistics graduate coordinator in addition to her duties as Director of Statistics, during David's leave.

There are several notable upcoming events which are described in detail below - our summer Math camps and other outreach activities, the return of the AARMS summer school to Dalhousie, and the American Mathematical Society Sectional meeting in October.

The Division Directors' reports highlight a number of curriculum developments. In addition, in the past year, Dalhousie has signed agreements with each of Shandong University of Finance and Economics, and Tianjin University, for 2+2 programs in both Mathematics and Statistics. In these programs students complete the first two years of their degree at their home institution, and the final two years at Dalhousie. We look forward to welcoming a cohort of 10 students from SDUFE who will begin their 3rd year in our department beginning this September.

Thanks to the many individuals, some named below, some not - faculty, students, members of our student societies and outreach groups - who are responsible for the diverse activities of our department. Special thanks to Angela, who does such a wonderful job of keeping our facility the best on campus, to Balagopal, who keeps us on the leading edge technologically, and to Ellen, Maria, Paula and Queena, who run the ship, and without whom, I would have been lost in my first year as Chair. Also, my sincere thanks to the past Chair, Karl Dilcher, whose sage advice I have sought on many occasions.

MATHEMATICS DIVISION
By Rob Milson

The coming year marks a number of significant transitions for the Division of Mathematics. In July, Peter Selinger will be taking over as director, and Richard Wood will be retiring from regular duties. In January of 2015, Keith Taylor will return from administrative leave to take up a regular appointment in the department. On behalf of the division, I thank Richard for his efforts across the years, extend a warm welcome to Keith, and wish the best of luck to Peter (who will have the delightful task of bossing around our former dean).

I also want to remind the division of the upcoming AMS regional meeting in October. Coming on the heels of the CMS summer meeting in 2013 this prestigious gathering further underscores the research accomplishments of the division at both the national and international level. We should also extend a warm thanks to Keith Taylor who was instrumental in bringing about both of these meetings.

Academically, the division is doing very well with robust and increasing enrolments across all levels of the curriculum. In the context of the recent discussion of the honours programme the following table is meant to serve as a useful indicator of enrolment trends.

	10/11	11/12	12/13	13/14
1500	27	29	16	44
2135	20	19	38	20
2505	13	24	30	28
3030	21	9	18	29
3500	11	10	13	15
4950	9	3	5	9

Math 2135, 2505, 3030, 3500 are the core honours courses. Math 4950 is the department honours seminar and is indicative of the number of graduating honours students. Math 1500 isn't an honours course per se; but as a first year course geared towards delivering an enriched mathematics experience, it can be regarded as an indicator of interest in mathematics by incoming students.

The coming year signals three significant changes to the divisional curriculum. The third year honours courses 3030XY and 3500XY have been divided into one term components numbered 3031/3032 and 3501/3502 respectively. The fourth year functional analysis course MATH 4140/5140 has been revived and will be taught by Keith Taylor in the winter term. Finally, thanks to the introduction of Math 4001 and Math 4002, senior undergraduates are now eligible to receive credit for participating in the AARMS summer school.

STATISTICS DIVISION
by Hong Gu

This year we have three faculty members on sabbatical leave. Joanna Mills Flemming has her first full year sabbatical leave, Mike Dowd was on sabbatical leave from July to December in 2013 and David Hamilton is on sabbatical leave from January to June in 2014. I am happy to report that statistics division is going to survive from this half-member-sabbatical crisis.

Congratulations to Joanna Flemming and Chris Field for the award for their CANSSI Collaborative Research Teams project. Joanna, Chris and three other faculty members from other universities across Canada have received a

$200,000 award for the project "Advances to State-Space Models for Fisheries Science" between 2014 and 2017. A large portion of the budget will be spent on the support of research students and/or postdoctoral fellows.

Mike Dowd attended and helped organize a workshop on Marine Biogeochemical Data Assimilation that took place May 28-30, 2013 in Hobart, Tasmania. This was generously funded by CSIRO (the Commonwealth Scientific and Industrial Research Organization - Australia's national science agency). It attracted attendees from around the world. One participant was Paul Mattern, a recently graduated Dal Statistics PhD who is currently a post-doctoral fellow at the University of California at Santa Cruz.

Work has begun on a new degree program in Actuarial Science. The concept paper for the new program has been approved by Faculty Council and by the SAPRC subcommittee. It is due to be reviewed by the SAPRC (Senate Academic Programs and Research Committee) on June 2nd. Assuming it is approved, work will begin on developing a detailed program proposal, which would again be reviewed by Faculty Council and Senate, and would then be submitted to MPHEC (Maritime Provinces Higher Education Council) for government approval. Meanwhile two new Actuarial Science courses will be offered next winter as electives for the Statistics curriculum. Another two new Actuarial Science courses have been approved by the Faculty Curriculum Committee, and will be offered starting in 2015/16. The Actuarial Science initiative has received tremendous support from other departments and from the university administration. Many thanks to all who contributed to the program proposal.

Starting this year, the AARMS Summer School will be held at Dalhousie for three years. This year, there will be two courses in Algebra and two courses in Statistics. The two Statistics courses are Statistical Learning with Big Data and Spatial Statistics. The directors of AARMS summer school are Sara Faridi and Hong Gu. More details about AARMS summer school can be found in the AARMS summer school section.

Our Master's student Michael Butler was awarded the best student science writing prize in the graduate category for his paper "A Proposed Predictive Model for Post-intubation Hypotension in High-Risk Vascular Surgery Patients" submitted to the Nova Scotia Institute of Science's 2013 Student Science Writing Competition. The prize included a cheque for $500 and was presented to Michael at the beginning of the April 7th NSIS Public Lecture at the Museum of Natural History auditorium.

Congratulation is also due to Kim Whoriskey, who has got both NSERC and Killam awards and will start her MSc study from this September in our department. I am also happy to report that the statistical consulting service will be active again, due to the arrival of our new PhD student, Lihui Liu, who has brought her years of statistical consulting experience here and will be our new statistical consulting service coordinator. All graduate students will be welcome to get involved in the consulting service and gain experience from the projects there.

Since Stat 2080 started to use the CAPA system for its assignments, it has received very positive responses from students. The CAPA system has also been used for the first time for the Stat 2080 midterm in the 2014 Winter term and the experience was successful. In addition, Christopher Herbinger has successfully applied for a teaching innovation fund which will be used to improve the CAPA system so that the process of inputting questions can be more automated. We plan to start the process of moving Stat 2060 and Stat 1060 into the CAPA system this summer term.

AWARDS DAY SPEAKER

This year's Awards Day Speaker is **Leonard MacLean** who is Professor Emeritus in the School of Business Administration here at Dalhousie.

After undergraduate degrees at St. Francis Xavier, Dr. MacLean completed his post-graduate mathematics studies in our department (M.A. 1972, and Ph.D. 1976). His academic teaching and research career has been centered at

Dalhousie, but has also involved Visiting Professor and Fellowship appointments in Italy, the UK, Zimbabwe, and British Columbia. His teaching responsibilities have been at both the graduate and undergraduate levels, and have been in the Departments of Commerce, Mathematics, Medicine, and Business. He has also served in academic leadership and management, as Director of the Health Services Research Unit in Dalhousie's Department of Community Health and Epidemiology, and as Director of the School of Business Administration from 1989-1995. He was the catalyst behind the establishment of the Risk Management Centre.

In what might be considered semi-retirement, Dr. MacLean's writing, editing, teaching and current research continues to be wide-ranging: Herbert Lamb Chair in Business at the School of Business Administration, and Professor in the Department of Community Health and Epidemiology. He is also a Research Associate, CanMac Economics, here in Halifax.

Dr. MacLean's more than 150 books, articles, and conference presentations show that mathematics touches just about every aspect of our lives. His work delves into the mathematics of risk in financial markets, aviation safety, health care, demographics, and education. In 1989, he was selected as Professor of the Year by MBA students. He has been honoured by Dalhousie University with the appointment as Professor Emeritus at the Rowe School of Business.

FACULTY NEWS

While the NSERC Discovery Grant results were in general very good for department members who were up for renewal, {\bf Theodore Kolokolnikov} received an outstanding and well-deserved boost to his funding. In addition to a large increase to his Discovery Grant, he was awarded an NSERC Discovery Accelerator Supplement Grant for the project "Collective behavior in complex systems". The award is valued at $40,000 per year over three years.
According to the award description, "The Discovery Accelerator Supplements Program

provides substantial and timely additional resources to accelerate progress and maximize the impact of superior research programs". Theodore joins **Chris Field** as second winner in three years of this prestigious and exclusive supplement grant.

Dorettte Pronk is serving as deputy leader for the Canadian International Math Olympiad team this year. The first training was in January, the second one is in June, and the Olympiad will be in July in South Africa.

In August, 2013, Dorette co-lead (with Laura Scull) a research team for the Women in Topology workshop at the BIRS center in Banff. The paper produced by their research group was just accepted for publication. Dorette had earlier spent the month of July, 2013, as a visitor at Macquarie University in Sydney, Australia, to work with Simona Paoli and Michael Johnson.

In last year's Chase Report I wrote about the International Year of Statistics (2013). In celebration of that year, the Statistical Society of Canada commissioned the book "Statistics in Action: A Canadian Outlook", published in 2014 by Chapman & Hall/CRC. **Joanne Mills Flemming** and **Chris Field** have a chapter entitled "Challenges in Statistical Marine Ecology" in this book.

Joanna Mills Flemming is also leader of the 'Visualization and Modelling of Complex Marine Observations' Cross-Cutting Activity for the Ocean Tracking Network and has hired a postdoctoral fellow (Marie Auger-Methe) who will commence in August, 2014.

Finally, as already mentioned in the Hong Gu's Director's report, Joanna and Chris are two of the five co-applicants who were awarded major funding from the Canadian Statistical Sciences Institute for the collaborative research team project "Advances to State-Space Models for Fisheries Science".

Peter Selinger's research work is featured in the January-February 2014 issue of *American Scientist*. "Programming your Quantum Computer" gives some insight into the future of computers

and the languages that will program them. See http://www.americanscientist.org/issues/pub/2014/1/programming-your-quantum-computer/

THE CHASE FAMILY

While over the years there were numerous weddings and babies to report, there was nothing at all in 2012/13. I am happy to report that department members heeded my urgent appeal, and things are now back to normal.

On August 13, 2013, a baby boy, Theodore, was born to **Rebecca Milley** and her husband Jonathan Milley.

On November 1, 2013, a baby girl was born to **Rogers Mathew** and his wife Meenu.

On November 19, 2013, a baby girl, Hazel Blossom Levy, was born to **Chris Levy** and his wife Joanna. Little Hazel is sister to Penelope and Isaac.

On November 27, 2013, a baby girl, Charlotte Rose Mendivil, was born to **Emma Connon** and her husband Franklin Mendivil.

Richard Wood and his wife Pamela got married on February 19, 2014.

On February 27, 2014, a baby girl, Elleen, was born to **Amal Al haddad** and her husband Turki Al haddad.

On March 29, 2014, a baby girl, Anagha, was born to **Balagopal Pillai** and his wife Ramya.

A baby girl, Nina, was born to **Theodore Kolokolnikov** and Shannon Peng on May 15, 2014. Little Nina is sister to Sebastian and Sasha, and she was born just before this Chase Report went to print.

Congratulations to all! -*kd*.

POSTDOCTORAL FELLOWS

Postdoctoral fellows have always greatly contributed to the Department's life, have strengthened our research profile, and usually taught at least one course per academic year. And some have returned later to become tenured faculty members in our department. Here are the postdoctoral fellows of 2013/2014.

Urban Larsson just arrived (May, 2014) at Dalhousie as our latest Killam Postdoctoral Fellow, to work with Richard Nowakowski. Urban did his graduate work at Chalmers tekniska högskola (Chalmers University of Technology) in Gothenburg, Sweden, where he received his M.Sc. and then his Ph.D. in 2013. His thesis research was on impartial games and recursive functions.

Rogers Mathew joined this department in the Summer of 2012 as the AARMS Director's PDF, to work with Jeannette Janssen. Rogers received his B.Tech degree in Computer Science at the University of Kerala, and his M.E. in Computer Science at the IIT Bangalore, where he also finished his Ph.D. in 2012. His research interests are in graph theory, graph algorithms and combinatorics, with special focus on geometric graph theory. Rogers left in September, 2013, and took up a post-doctoral position at Haifa University in Israel.

Rebecca Stones did her undergraduate studies at Monash University in Melbourne, Australia, where she also received her Ph.D. in 2009 with a thesis on Latin squares and rectangles. After a postdoctoral position at Nankai University in China and an Assistant Lecturer position at Monash University, she joined our department in January of 2013, to work with Jeannette Janssen. Apart from a continued interest in her thesis topic and in computational number theory, her research interests include complex networks. Rebecca returned to her native Melbourne in January of 2014.

Justin Tzou arrived in September, 2013, as AARMS Postdoctoral Fellow, to work with Theodore Kolokolnikov. He received his undergraduate degree in Engineering Physics at UBC, and his Ph.D. in Applied Mathematics at Northwestern University in Evanston, IL, in the Fall of 2012. He then held a first postdoctoral appointment at the Technion in Haifa. Justin's main area of research focuses on analyzing diffusion-driven spatial pattern formation in different regimes of reaction-diffusion systems.

Huaichun Wang received his Ph.D. in Biology at the University of Ottawa in 2005, and is a Postdoctoral Fellow funded by the Center for Comparative Genomics and Evolutionary Bioinformatics. His research interests include Molecular Evolution and Bioinformatics, and he has worked with Ed Susko and Andrew Roger of the Department of Biochemistry and Molecular Biology on statistical modelling of protein sequence evolution.

Ximing Xu received his B.Sc. in Mathematics at Nankai University in Tianjin, China, and his M.Sc. at the University of Ottawa. He then did his Ph.D. in Statistics at the University of Toronto under the supervision of Nancy Reid. After graduating in the Summer of 2012 he joined our department to work with Chris Field. His research interests include composite likelihood inference and comparative genomics.

VISITORS

In addition to our postdoctoral fellows, research visitors also contribute to the department's overall research climate. Once again this year we've had several medium- to long-term visitors from several different countries.

Fahimah Al-Awadhi is an Associate Professor at Kuwait University, and is the Head of the Statistics and Operations Research Department there. She received her Ph.D. at the University of Bath in England. She has spent the past academic year with us as a guest of Hong Gu; she is also engaged in joint research with Ammar Sarhan.

Karen Chandler spent the year with us as a visiting scholar. She actually received her honours B.Sc. with us, and later received her Ph.D. in algebraic geometry from Harvard University. She

has recently worked with Sara Faridi, and has also been a regular participant of the legendary Tuesday Lunch.

John Cosgrave, an annual visitor from Dublin, Ireland, spent 3 weeks with us in March of 2014. He worked with Karl Dilcher on problems in elementary and computational number theory, especially "Gauss factorials" and congruences of sums of reciprocals.

Tatiana Hessami Pilehrood and **Khodabakhsh Hessami Pilehrood** are longer-term visitors to our department. They both received their Ph.D. degrees at Moscow State University, and later taught at Shahrekord University in Iran. Both Tatiana and Khodabakhsh are number theorist, working with Karl Dilcher. Tatiana has also been teaching for us on a part-time basis.

Aaron MacNeil is actually a Dalhousie graduate with a B.Sc. in Marine Biology (2001). He received his Ph.D. in that field from the University of Newcastle upon Tyne (UK) in 2007, and now holds positions with the Australian Institute of Marine Science and the Bedford Institute of Oceanography. Here in our department he works with Chris Field and Joanna Mills Flemming.

Patrick Sundin of the Max Planck Institute for Gravitational Physics (Albert Einstein Institute) in Germany and **Genly Leon** of Chile visited our department for the month of February, 2014, to work with Alan Coley.

Henri Chataing of the Ecole Polytechnique in Palaiseau, France, worked with Peter Selinger as an intern from April 15 to August 16, 2013. A second intern working with Peter was **Baranidharan Mohan** of IIT Delhi, India, who was a MITACS intern from May 20 to July 27, 2013.

Richard Nowakowski had a number of visitors in 2013, namely **Michael Fisher** of West Chester University, USA, in June, **Urban Larsson** of Chalmers University in Sweden, in June-July, **Carlos Santos** of the University of Lisbon, Portugal, also in June-July, and **Michael Albert** of the University of Otago, New Zealand, in October.

David Gomez-Ullate of Complutense University, in Madrid, Spain, visited Rob Milson for 2 weeks in 2013. Dr. Gomez-Ullate will return for an additional two weeks this June.

HE DID IT AGAIN

In last year's edition of this publication I reported that **Jin Yue** was awarded the Dalhousie University Faculty of Agriculture 2013 Award for Teaching Excellence. Well, he did it again, this time with a university-wide award. At the May 12th Senate Meeting, Jin was awarded the Sessional and Part-Time Award for Excellence in Teaching. For more details, see http://www.dal.ca/news/2014/05/15/knowledge--passion-and-pride--celebrating-dal-s-top-teachers.html

Jin received his Ph.D. in mathematics in 2005 under the supervision of Roman Smirnov, and an M.Sc. in Statistics in 2008, supervised by Bruce Smith. Jin has taught for several years now at the Faculty of Agriculture (formerly the Nova Scotia Agricultural College) in Truro. *–kd*

A REUNION OUT WEST

Three former and one current faculty members came together at a special event at Simon Fraser University in Burnaby, BC. On April 16, 2014, the IRMACS Centre at SFU hosted a workshop in honour of David Borwein (Western) on the occasion of his 90th birthday. The event was attended by **Jon Borwein** (now at the Univ. of Newcastle, Australia), **Peter Borwein** (SFU), and **Tony Thompson** who is retired and lives in Vancouver. All three were long-time members of this department. Karl Dilcher also attended the workshop, representing Dalhousie and also the CMS, whose president David Borwein was from 1985 to 1987. *-kd*

IN MEMORIAM

Anne Ellen Fillmore died on December 1, 2013, at age 78. She is survived by her husband Peter Fillmore, a Professor Emeritus in our department, and by three children and five grandchildren. Anne Ellen was born in Berwick, NS. She attended the Nova Scotia Teachers' College and Dalhousie University, and taught in Dartmouth and Berwick. After getting married in 1960 in Nova Scotia, Anne Ellen and Peter moved to Minneapolis, and subsequently to Chicago and Bloomington, Indiana. In 1972 the family returned to Halifax, and from 1974 until her retirement in 1996 Anne Ellen taught English at different junior high schools and high schools; her last position was at Queen Elizabeth High School. She also worked towards her M.Ed., which was awarded to her in 1991 by Dalhousie. In retirement Anne Ellen and Peter continued to share their passion for singing and for Opera; they have been members of several different choirs. Anne Ellen is fondly remembered by many department members, and some of us have fond memories of her as the gracious hostess of some legendary department parties at the Fillmore's on Robie Street.
She will be missed. *-kd*

A NEW SCHOLARSHIP

We are happy to report that Dalhousie received a major gift to endow a new scholarship for a mathematics student. Elizabeth and Laurence G. Etter of Florida established a fund in memory of Elizabeth Etter's mother, Erma Geddes Fillmore (Dalhousie BA, 1924). The purpose of the *Erma Geddes Fillmore Memorial Scholarship* is to recognize and provide scholarship funding for students enrolled in the Faculty of Science with a declared major or honours in Mathematics or Statistics. While some details are yet to be worked out, the first annual scholarship will be awarded within a year. Below is a brief biographical sketch provided by the family.
The Department of Mathematics and Statistics is very grateful to the Etter family for this substantial scholarship which will truly make a difference. – *kd*

ERMA ELIZABETH GEDDES was born on Easter Sunday, April 7, 1901, in the Highland Village, Colchester County, Nova Scotia. Her school years were spent in a one-room schoolhouse until at the age of 16 the Geddes' family moved to Great Village, NS and Erma was sent to Halifax Ladies College for two years prior to entering Dalhousie University. She graduated from Dalhousie with a Bachelor of Arts (BA) in 1924 with a strong interest in Science and Mathematics. Emma taught school in Connecticut for a few years; then returned to Nova Scotia and married Charles Fillmore in 1927. She had two children, Elizabeth and Keith. She was a long-time member of St Andrews United Church in Truro where she spent the rest of her life. She was active in UCW, University's Women's Club, Truro Historical Museum and enjoyed playing bridge. Emma died in 1992 at the age of 91. Always interested in education, her daughter, Elizabeth, has established this scholarship in her mother's memory.

KANGAROOS AND OTHER CHALLENGES

In addition to other competitions, such as the Putnam (for undergraduates) and the Math League mentioned elsewhere in this publication, our Department has also been affiliated with two relative newcomers on the competition scene.

The **Math Kangaroo Contest** is an international contest with national chapters, and the competition is administered in a growing number of locations across Canada. Currently 26 sites from Newfoundland to BC are involved and, here in Halifax, the contest is organized and administered by Lois Murray of the Department of Microbiology & Immunology. This year's contest was held on March 23rd in the Learning Centre, Colloquium Room and Seminar Room in the Chase Building. With 3332 contestants in Canada, the numbers in Halifax are growing exponentially, from 37 students in 2012, the first year Kangaroo was hosted here, to 52 students in 2013, and 97 contestants in 2014: this number of students is the maximum the Chase Building can hold! These young Nova Scotia Mathletes are scoring well, nationally: 3 students placed in the Top 2%, 1 in

the Top 5%, 5 in the Top 10% and 12 in the Top 25% of Canadian contestants. The awards ceremony will be held at the end of May.
For further information about the Canadian Math Kangaroo Contest, see http://kangaroo.math.ca/

Another competition, mainly for high school students, is the **Canadian Open Mathematics Challenge**. This contest, which is something like a "feeder competition" for the (invitational) Canadian Mathematical Olympiad, is administered by the CMS. In 2012, our department joined as an institutional partner under the leadership of Richard Nowakowski. In particular, after the competition was written in schools throughout the country, Richard organized the grading effort for the exam papers (roughly 100) of the Nova Scotia participants. Several faculty and graduate student helped with the grading. For more information on the COMC, see
http://cms.math.ca/Competitions/COMC/2013/

3.14… AND ALL THAT

While Pi as a number remains constant (in the Euclidean metric at least), the annual Pi Day event keeps growing. In fact, this year the Graduate Student Society, who hold the department's right to Pi, moved this year's March 14th (3-14) event to the Colloquium Room (from the usual 2nd floor lobby and lounge), and still managed to pack this larger venue. Once again someone tipped off the CBC, and a reporter and camera person chased at least one hapless faculty member around the building who had been falsely accused of being a specialist on facts about Pi. While this person escaped, others didn't, and Lucas Mol has been immortalized on
http://www.cbc.ca/news/canada/nova-scotia/math-lovers-celebrate-pi-day-at-dalhousie-university-1.2573099?autoplay=true
as well as
http://www.cbc.ca/player/News/Canada/NS/ID/2441969085/, reciting an embarrassingly large number of digits of Pi. Danielle Cox is also quoted on the first link above.

Some purists, meanwhile, complained about the fact that the official cutting of the pie took place at 12 noon, rather than at the correct 1:59 pi.m. and 26 seconds. *-kd*

SUMMER RESEARCH AT UCLA

Who wouldn't want to spend the Summer in California? It would be second only to a Summer in Nova Scotia. Two of our undergraduate students had this opportunity last Summer (2013). The following is based on a report by Theodore Kolokolnikov.

Yuxin Chen and **Paul Chavy-Waddy** participated in a Summer Research Program run by the Mathematics Department at UCLA, called "California Research Training Program in Computational and Applied Mathematics". Theodore Kolokolnikov also participated as a mentor.

Yuxin worked with the Shape Processing and Recognition group. The final goal of the project was to learn and apply various computer algorithms to recognize certain shapes. Paul's group applied several statistical methods (such as spectral clustering, principal component analysis, topic modeling and multiple regression) to the Yale-PEP database which traces the health histories of 700 elderly patients over a period of 15 years. It was a very intense hands-on learning experience, working with messy real-world data, both for the students as well as the supervisors. Paul is continuing this research this summer with

Dr. Rockwell and Prof. Arnold Mitnitsky from Dalhousie's school of medicine, geriatric medicine research.

UNDERGRADUATE MATH CONFERENCE

As almost every year, undergraduate students from this department have attended the annual Canadian Undergraduate Mathematics Conference. The 2013 conference took place at the Université de Montréal, and the Dalhousie team consisted of six students, four of whom gave talks. The participants, and the titles of their talks, were **Jana (Elle) Anderson-Aiken** ("How Tigers Get Their Stripes"), **Manisha Bali**, **Dario Brooks** ("Local Equivalence of 3-dimensional Godel space-times"), **Mohammad Kidwai**, **Nathan Musoke** ("Holonomy of 4-Dimensional Metrics"), and **Julia Tufts** ("Mathematics and Music").

Our student participants received travel funds through generous donations to Dalhousie's annual fund. For more details, including abstracts of the student talks, see http://cumc.math.ca/2013/.

This year's CUMC will take place at the Carleton University, July 2-5, 2014. Once again, we expect that a number of undergraduate students will attend this conference, again largely funded by the department through donations.
See http://cumc.math.ca/2014/ *-kd*

COMPUTING RESOURCES
by Balagopal Pillai

The computing resources in the department, including the department machine room, operated without any major issues this past year. One major change that happened last year was the discontinuation of our department email service in favour of Microsoft Office 365, as part of a university-wide initiative.

The compute cluster received major OS overhauls to keep pace with new versions of software. Our LON-CAPA server used for Statistics course assignments was deployed for conducting on-line exams for the first time and the trial was successful. Several new server and storage deployments happened this past year in the Chase and Killam machine rooms. A wall-mounted ultra short throw projector is expected to be installed in the Colloqium Room this summer; it will provide connectivity via vga and hdmi as well as over the network for up to 4 simultaneous presenters.

THE DEPARTMENTAL LIBRARY

As reported in previous years, I keep a stock of old mathematics, statistics, and C.S. books, with the more elementary books stored in Room 107, and the more advanced ones in the library and in Room 305. All are for sale, with the proceeds going towards the purchase of new books. Many of the more advanced books are catalogued at http://www.mathstat.dal.ca/~dilcher/oldbooks.html This stock is being replenished regularly through donations. For instance, a year ago a retired teacher walked in with two boxes of high-level books of high quality. And this Spring, Renzo Piccinini, about whom I reported in last year's Chase Report, donated a large number of high-quality books to the department. Any such books not already in the Killam library will be available for sale, typically at $10 - for a hardcover book, and $5 - for a paperback. Further donations of Math, Stats and CS books are always welcome, and that includes textbooks.

Maryam Ehya Jahromi has been looking after the day-do-day operation of the library. However, please see the following article on the future of our library. Meanwhile, Swami continues to send out the weekly "New Books" mailings, with those interesting biographical/historical sketches. I thank both Maryam and Swami. *-kd*

THE END OF AN ERA

For 23 years after our department moved into the Chase Building in 1985, the departmental library – consisting of the collection of all Mathematics and about half of all Statistics journals at Dalhousie – was the proud centerpiece of our department. In fact, the department leadership at

the time fought very hard to have our library move together with the department from the Killam Library (where the department was located for a number of years, until 1985) to the Chase Building. The older members of the department will still remember the hard-fought battle with the Library Administration, which ended in a compromise imposed by the VP Academic, according to which the journals would move with us, while all books remained in the Killam Library.

Until 2008 we had one of the most pleasant departmental libraries in the country, but then things changed rapidly, and keep changing, in parallel to a fundamental shift in recent years to a near-universal use of electronic journals. First, in recognition of the importance of pleasant and ample spaces for students, the library and learning centre switched spaces in the Summer of 2008. Then, in July of 2010 the basement of the Chase Building, and in particular the library, was struck by a disastrous flood which destroyed hundreds of volumes of mathematics and statistics journals.

The next change to our library has recently begun: By the end of this Summer all journals will be moved to the Killam Library, to make room for extra student space. This shortage of space is "a good problem to have" as it reflects the growing numbers of graduate and honours students we have seen in recent year.

Still, some of us will sorely miss what used to be the centre of our department.-*kd*
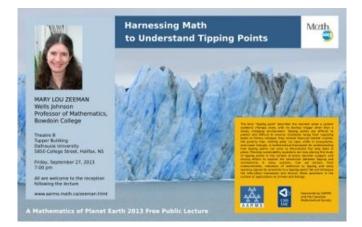
A NEW NEIGHBOUR

A few years ago Dalhousie received a major donation from the McCain family to build the "Wallace McCain Learning Commons", which was originally supposed to be located in the LSC courtyard. However, after much delay, mainly caused by structural and other problems with that location, a new location was only very recently announced (in early May, 2014). It is our understanding that the Learning Commons will be constructed in the area roughly bounded by the LSC-to-Chemistry link to the South, the Chase

Building to the North, and the Chase tunnel on the East side.

This project has been given high priority, and construction is set to begin this June. While the Chase Building itself will not be directly affected, the very close proximity to the construction site will likely lead to problems with noise and dust. The Chase community will be kept informed on the progress of this fairly major project. -*kd*

MATHEMATICS OF PLANET EARTH
by Jeannette Janssen

The year 2013 was declared the Year of Mathematics of Planet Earth. This was a Canadian initiative, which was taken up across the world, and recognized by Unesco. The goal was to show how mathematics can help understand the processes that govern our planet, and help predict and mitigate the effect of our actions. As part of this special year, two special lectures were held.

The first was a public lecture, held on September 27. This lecture was co-sponsored by AARMS and the CMS, and organized by David Iron. The speaker was Mary Lou Zeeman of Bowdoin College, a renowned researcher and educator whose research involves the use of dynamical systems to understand natural processes. Her lecture, titled "Harnessing Math to Understand Tipping Points", gave a beautiful elementary introduction to the mathematics behind the notion of "tipping point". She then discussed we can find indicators of resilience to tipping and early warning signals for proximity to a tipping point. She gave examples of how we can use the results of mathematical analysis to "tip" certain natural conditions towards a more ecologically sound equilibrium, for example, turning a lake from algae-infested to clear. Dr. Zeeman's lecture fell on the same day as the release of a new report by the IPCC, and she included a discussion of some of the findings in her talk.

Picture: A Nonlinear Wave (courtesy Alex Hay, Department of Oceanography)

The second lecture was a special joint colloquium with the department of Oceanography. The speaker was Walter Craig, Director of the Fields Institute and CRC at McMaster. The organizer of this colloquium was Keith Thompson, and it was held on October 15. Dr. Craig's research focuses on the understanding of waves. Dr. Craig gave a public MPE lecture on tsunamis at UNB Fredericton a week before, and followed up on that lecture by giving a more detailed talk at Dalhousie focusing on the interaction of large and small waves. The talk gave a great introduction to the mathematical analysis of the propagation of waves, and showed how different scales require different type models. He showed examples of oceanic effects that have been observed and can only be explained as an interaction between the effect of waves at widely differing scales, and expressed his ambition to help find a comprehensive model which would be able to predict and understand such effects in a general sense.

AARMS REPORT
by Jeannette Janssen

Over the last two decades, AARMS has worked to strengthen education and research in the mathematical sciences in Atlantic Canada. Lately, we received some good news. AARMS has received an increase of funding from the province of Nova Scotia, and is recognized by the provincial government as a partner towards its goal of increasing math skills and building a highly skilled workforce. Working towards this goal, AARMS plans to take an active role in coordinating the variety of outreach activities, such as Math Circles and Math League. AARMS has also formed an agreement with Science Atlantic to become a co-sponsor of the annual Math, Stats and Computer Science Undergraduate Conference. We plan to make AARMS a more visible presence in the department, and invite all members to help promote AARMS.

AARMS also took part in an NSERC competition which provides funding for mathematics institutes.

AARMS applied indirectly (through an appendix to the applications of CRM, Fields and PIMS), but was invited to present its activities and to participate in the review meeting held in March. We are encouraged by the positive feedback received from the Review Committee and NSERC staff. The application process has also led to closer ties with the other mathematics institutes across Canada.

This year, AARMS supported activities in the department in various ways. The first generation of AARMS Collaborative Research Groups, which ended this year, involved five members of our department. In September, a new CRG on Graphs and Games started, which is led by Prof. Richard Nowakowski. Dr. Justin Tzou is an AARMS post-doc, and Drs. Rogers Mathew and Rebecca Stones were supported by AARMS with the Director's PDF awards. The 2013 AARMS Summer School will be held in our department, jointly directed by Sara Faridi and Hong Gu. AARMS and CMS presented a public lecture by Prof. Mary Lou Zeeman on "Harnessing Math to Understand Tipping Points" and a lecture by Prof. Walter Craig on "Waves and wave interactions: from small scales to very large". In addition, AARMS supported various activities organized by department members.

THE AARMS SUMMER SCHOOL
by Sara Faridi and Hong Gu

The AARMS Summer School has been running annually since 2002. It has been hosted at Memorial University (2002-2004 and 2011-2013), Dalhousie University (2005-2007), the University of New Brunswick (2008-2010), and now again at Dalhousie (2014-2016).

In 2014, the themes for the school will be Commutative Algebra (Gröbner Bases in Commutative Algebra, and Homological Conjectures in Commutative Algebra) and Statistics (Statistical Learning with Big Data and Spatial Statistics). It will take place from July 21 to August 15. The Summer School will also be supported by the Canadian Statistical Sciences

Institute (CANSSI) and the Fields Institute for Research in Mathematical Sciences.

The Summer School is aimed at graduate students and upper-level undergraduates thinking about the possibility of graduate studies. We will be welcoming 50 students from Atlantic Canada and from around the world. We look forward to a busy month of hard work, to exciting lectures and problem sessions, and to showing our beautiful province of Nova Scotia to our visitors.

TWO DOWN, TWO TO GO

As reported in last year's edition, our department hosted, or will be hosting, four large conferences in a row, one each for the most important professional organizations for our two disciplines. After a very successful SIAM Discrete Mathematics meeting in June, 2012 and an equally successful CMS meeting in June of 2013, we are now looking forward to an AMS meeting on October 18/19, 2014, organized by Peter Selinger, and the SSC Annual Meeting, June 15-18, 2015, organized by Ed Susko.

While next year's Chase Report will certainly contain more information about the SSC meeting, here are some details about the American Mathematical Society Eastern Sectional Meeting on October 18-19. It will consist of 14 special sessions, as well as four invited addresses by Francois Bergeron (UQAM), Sourav Chatterjee (Stanford), William M. Goldman (U. Maryland), and Sujatha Ramdorai (UBC). Of the special sesscions, the following are organized or co-organized by current or past department members:

Commutative Algebra and Its Interactions with Algebraic Geometry (Susan Marie Cooper, Sara Faridi, and William Traves)

Experimental Mathematics in Number Theory, Analysis, and Combinatorics (Marc Chamberland and Karl Dilcher)

Games on Graphs
(Jason Brown and Jeannette Janssen)

Hopf Algebras
(Margaret Beattie and Mitja Mastnak)

New Directions in Category Theory
(Pieter Hofstra and Dorette Pronk)

We look forward to an exciting meeting in October. Many thanks to Keith Taylor for helping to bring this meeting to Halifax, and to Peter Selinger for his hard work, past and future. *-kd*

WORKSHOPS AT DAL

In addition to the major conferences mentioned above, department members organized a number of specialized workshops, most of them in conjunction with the CMS Meeting. They were, in chronological order:

1. **International Workshop in Combinatorial Algebra.**
Organized by Sara Faridi with co-organizers Margaret Beattie (Mount Allison), Mikhail Kotchetov (Memorial), Mitja Mastnak (Saint Mary's), Hamid Usefi (Memorial). Dalhousie and Saint Mary's, June 1 - 4, 2013.

The aim of this Workshop was to discuss the current state of research in several interrelating areas of modern Combinatorial Algebra, with emphasis on the Combinatorics of Commutative Algebras, Groups and Hopf Algebras.

The program included a total of of 23 lectures and longer research talks, as well as a number of shorter research communications. One session on June 2 was dedicated to the work of Professor Tony Geramita from Queens University and one on June 3 to Professor Luzius Grunenfelder, a retired Dalhousie Professor (now at UBC). The last day consisted of an AAC Mini Course entitled "Commutative Algebra" organized by Sara Faridi with lecturers Juergen Herzog and Giulio Caviglia. The event was concluded with a dinner at Peggy's Cove on June 4th.

The total number of participants was 46: 16 from Atlantic Canada, 11 from other provinces of Canada, 19 from other countries.

The workshop was a satellite event to two special sessions of the Summer 2013 Meeting of Canadian Mathematical Society, which ran on June 4-7. These sessions were "Commutative Algebra and Combinatorics" and "Hopf Algebras and Tensor Categories". The Workshop was supported by the Atlantic Algebra Centre at Memorial, by AARMS, Dalhousie University, and Saint Mary's University.

2. **Number Theory Satellite Session**, June 8, 2013. Organized by Karl Dilcher. This one-day workshop featured mainly talks by local number theorists, including graduate students. The speakers were:
Jan Minac (Western), Claudio Quadrelli (Western), Dante Manna, Tatiana Hessami Pilehrood, Keith Johnson, Kira Scheibelhut, Karyn McLellan, Khodabakhsh Hessami Pilehrood, Abdullah Al-Shaghay, Rob Noble, Douglas Staple, Antonio Vargas, and Karl Dilcher.

3. **Games-at-Dal 8** was held June 2013, in conjunction with a special session at the summer meeting of the Canadian Mathematical Society. Attendees: Alex Fink (UK), Urban Larsson (Sweden), Neil McKay (Can), Rebecca Milley (Can), Paul Ottaway (Can), Gabriel Renault (France), Carlos Santos (Portugal), Aviezri Fraenkel (Israel), Richard Nowakowski (Can), Elham Roshambin (Can), Angela Siegel (USA), Mike Weiemerkrisch (USA), David Wolfe (Can). Topics: the Invertibility Conjecture for misere games; a constructive universe of scoring games; and Take-Away games on Ferrer's Diagrams.

4. **Combinatorial Algebra meets Algebraic Combinatorics**, Eleventh Annual Meeting. Organized by Sara Faridi, with co-organizers Hugh Thomas (UNB), Mike Zabrocki (York). Dalhousie University, January 24-26, 2014.

This year it was a lively and well-attended meeting, with many outstanding talks. The invited speakers were:
    Drew Armstrong (University of Miami)
    Ezra Miller (Duke University)
    Mike Roth (Queens University)
    Mark Skandera (Lehigh University)
    Julianna Tymoczko (Smith College)

There were 11 contributed talks as well. The talks covered a broad range of topics in combinatorial algebra and algebraic combinatorics, leading to lively discussions and problems to think about. Once again, two Dalhousie students presented their ongoing research. There were many comments on the quality of the talks this year.

NOVA SCOTIA MATH CIRCLES
by Danielle Cox

During this school year our program was partially supported by the Atlantic Association for Research in the Mathematical Science (AARMS). They sponsored our two regional trips to the Chignecto-Central Regional School Board and Tri-County Regional School Board.

Dr. Richard Nowakowski continues to be the Faculty Advisor and a great support to the program. Danielle Cox is the Program Director, and our Presentation Team consists of Julien Ross, Huda Chuangpishit, Alain Gamache, Svenja Huntemann and Abdullah Al-Shaghay, as well as newcomers Julia Tufts, Bassemah Alhulaimi, Darien DeWolfe and Holly Steeves.

For our local events, we had guest speakers from the Math & Stats Department (Danielle Cox, Julien Ross, Svenja Huntemann, Elham Roshanbin), the Physics & Atmospheric Science Department (Dr. Tom Duck) and the Faculty of Computer Science (Dr. Nauzer Kalyaniwalla). As well, Dr. John McLoughlin of UNB Fredericton, Dr. Paul Muir of Saint Mary's University and Alain Gamache, a teacher in the CSAP (the francophome school board), also gave presentations. Attendance at these events ranged from 30 to 60 students.

Over the Summer of 2013 we developed additional resources for junior high schools and focused much of our outreach this year to that grade level, while continuing to provide presentations for high schools. We even dabbled in some elementary outreach, teaching a local grade 4 class all about the Mobius strip! Our travels took us to school within the HRM, Chignecto-Central School Board, Annapolis Valley School Board, Tri-County

School Board and to various home educator groups and ESL classes. We also gave a presentation at the annual Math Teachers Association Conference in October 2013. This school year, so far, we have presented to over 2300 students province-wide.

In May the 4th annual Discover Math Days took place. We hosted two mornings of outreach to local junior high students, resulting in 80 students visiting the department to explore creative problem solving with the graduate students running the round-robin stations.

This Summer the NS Math Circles team will be announcing some very exciting news regarding the program, so keep up-to-date by visiting www.nsmathcircles.com!

NOVA SCOTIA MATH LEAGUE
by Danielle Cox

The NS Math League has had a successful year! Students and teachers from across the province came to Dalhousie in April to partake in the Math League Finals. It took place in the Learning Centre in the Chase Building and all 80 participating students had a great time! The top team was C.P. Allan High School, followed by Cole Harbour District High School and Middleton Regional High School. It was a close and exciting game. C.P. Allan dominated the contests all year and were worthy of the first place prize.

Dr. John Irving of Saint Mary's University ran the contests with assistance from Dr. Richard Nowakowski, Danielle Cox, Abdullah Al-Shaghay and Chris Rector.

MATH CAMP 2013 REPORT
by R.P. Gupta

The Dal-BEA Math camp for Black Students was held from July 7-12, 2013. Twenty Eight students attended the camp. Seventeen were female and eleven male; they came from Junior high schools from all over Nova Scotia. On Sunday, July 7, 2013, parents brought the students to Howe Hall, where registration and a reception are held. The

students and their parents were told about the expectation and responsibilities. They stayed in Howe Hall under the supervision of four chaperones - Nakie Davies, Dominic Hudlin, Raya Borden-Parsons and Kabu Davies. Mornings and two afternoons were devoted to the academic teaching. The instructors were: Mr. Gerry Clarke, Dr. Chelluri Sastri, Mr. Preman Edward and Dr. Nauzer Kalyaniwalla. On Monday afternoon the campers visited the museum and in the evening a career night presentation was made by Mr. Alison Barton and Ms. Angela Njock. They discussed the importance of education and the vital role mathematics plays in the business world. The students were very focused and engaged and the Q&A session was amazing. On Wednesday night the students went to the Black Cultural center and NSCS campus in Dartmouth, where Mr. Henry Bishop (Curator) gave a lesson on the history of African Nova Scotians and Mr. Gerry Clarke, principal of the campus, described various trade programmes offered at this campus. On Thursday night, the students were given a tour of the Discovery Center where they engaged in several activities of science experiments.

From 3:30 - 4:30 p.m. they had a relaxed time at Dalplex where they were engaged in volley ball, swimming and other sports.

The camp was organized under the directorship of Professor R.P. Gupta and Mr. Alex Bizzeth of B.E.A. It was financially supported by the President's office of Dalhousie University and the Canadian Mathematical Society.

DALHOUSIE-CMS MATH CAMP
July 7-12, 2013
by Roman Smirnov

As always, during the second week of July the Department of Mathematics and Statistics at Dalhousie University hosted last year the Dal-CMS math camp, whose goals were to identify, stimulate and encourage mathematical talent among Nova Scotia high school students.

The camp was jointly sponsored by Dalhousie University and the Canadian Mathematical

Society. It consisted of lectures and problem solving sessions conducted by faculty members and graduate students from Dalhousie, and also included extracurricular activities. The Math Camp was organised by Danielle Cox, Suraj Sikka and Roman Smirnov. The speakers at the Dal-CMS Math Camp were the following faculty members and grad students (with the titles of their respective talks in the parentheses): Karl Dilcher (A mathemagical mystery tour: Large numbers and great mathematicians), Caroline Cochran and Roman Smirnov (Mathematical induction), Danielle Cox and Svenja Huntemann (Million Dollar Hat Problem), David Hamilton and Bruce Smith (Latin Squares, Sudoku and Kenken), Karyn McLellan (Continued fractions: Pattern hunting), Richard Nowakowski (Counting problems from games), Elham Roshanbin (Some combinatorial problems), Peter Selinger (Pythagorean triples), Srinvasa Swaminathan (Solving Polynomial Equations).

The students were chaperoned by Leigh Herman and Elham Roshanbin. Last but not least, our great staff, Queena Crooker-Smith, Maria Fe Elder, Paula Flemming, Balagopal Pillai, and Ellen Lynch did a fantastic job taking care for most of the administrative aspects of organising the camp.

This year's Math Camp is being organized by Danielle Cox, Caroline Cochran and Roman Smirnov.

GRADUATE STUDENT SOCIETY
by Svenja Huntemann

The graduate society was very busy this year putting on many events for grad students and other members of the department. In September, we had our Annual General Meeting and voted for the new executive (Svenja Huntemann, president; Aysel Erey, vice-president; Bassemah Alhulaimi, secretary/treasurer; Joseph Mingrone, department representative; and Darien DeWolf, Lett Bursary representative).

Enjoying the nice weather, we then had a potluck picnic including the families of graduate students. We hosted a Halloween party with costume

contest, and organized a Secret Santa at the department's Christmas Party. In the winter term we celebrated Chinese New Year and Persian New Year, and treated grad students with their partners and families to dinner at the Athens Restaurant.

Our annual Pi Day party was a big hit again with the department. The Colloquium Room was decorated with everyone's favourite number, and lots of pie and other circular food were eaten. We also held two general meetings followed by games nights, and had monthly get-togethers with timbits served in the lounge. As fundraisers, we again organized end-of-term tutorials for first year calculus and statistics, which were very well attended.

For the summer, we so far have another games night and picnic planned, which we will add to as the term progresses.

THE CMS STUDENT COMMITTEE
by Svenja Huntemann

This past year, Svenja Huntemann and Nathan Musoke joined the CMS Student Committee (Studc) representing students in Atlantic Canada. Studc gives a voice to students within the CMS, and organizes many events, such as the poster sessions and student socials at each CMS meeting. They also oversee the Canadian Undergraduate Mathematics Conference, and produce a semi-annual newsletter (Notes from the Margin).

THE UNDERGRADUATE MATHEMATICS AND STATISTICS SOCIETY (DUMASS)
by Dario Brooks

2013/2014 Council members:
President: Dario Brooks
Vice President: Nathan Musoke
Treasurer: John Mullins
Secretary: Julia Tufts
Communications officer: Manisha Bali
DSS Representatives: Thomas Crowell, Ben Potter, Justin Slayter, and Katherine Ryan.

The Dalhousie Undergraduate Mathematics and Statistics Society had an amazing 2013/2014 year. A group of dedicated and hard working mathematics and statistics students, our Executive Council dedicate countless hours to ensure that the environment at Dalhousie and within the Math and Stats Department is a comfortable and welcoming one for their fellow students in the mathematical sciences.

This year, the efforts of the council members were as evident as ever. As always, the society started off the year with their traditional meet and greet event, giving students a chance to speak with each other and meet some of their professors in a stress-free setting before buckling down for a year of hard work. There was no shortage of fun this year with a social event happening every month (including the popular annual Wine and Cheese), and the introduction of the first ever Math-Stats and Economics combined event, the "Math-for-Econobrew", which is sure to become a traditional event within the department for years to come. In addition to the yearly Math and Stats clothing order, the society decided to introduce custom made Dalhousie Mathematics and Statistics Department coffee mugs for purchase, as well as a Tassimo brewing machine open for use by anyone who passes through the department – both proved to be a hit with staff, faculty, and students alike.

This year's DUMASS Executive Council sends congratulations to all those who are graduating from their respective programs this May, and would like to extend best wishes to everyone in their future endeavours. We would also like to thank everyone who attended our social events this year for the support and loyalty, and hope to see them in the near future.

A warm welcome to the incoming Executive Council, and best of luck in the 2014/2015 year:
President: Justine Gauthier
Vice President: Megan Douglas
Treasurer: Kyle MacQuin
Secretary: Mikaela DeBoer
Communications officer: Brandon Elford
DSS Representatives: Ryan Ambrose and Dario Brooks

MATHEMATICS COLLOQUIUM

Organizer: Peter Selinger

As in every year, the Mathematics Colloquium featured an interesting mix of talks from many areas of mathematics. In October, there was a special colloquium by Walter Craig, Director of the Fields Institute and Canada Research Chair at McMaster University, on "Waves and wave interactions." This talk was jointly organized by Oceanography and Mathematics, and co-sponsored by AARMS. I would like to thank all members of the Chase community who suggested speakers. This year's talks were:

June 3, 2013: Gary Gordon (Lafayette), *From the chromatic polynomial to network reliabilit*y.

June 14, 2013: Ian Wanless (Monash University), *Embedding spherical Latin trades in abelian grou*ps.

June 17, 2013: Massimo Caboara (Pisa), *An application of approximate border bases to celestial mechanics*.

June 20, 2013: Vignon Oussa (Bridgewater State University), *The orbit method and its applications*.

July 4, 2013: Reem Yassawi (Trent University), *A characterization of p-automatic sequences as columns of linear cellular automata*.

Oct 15, 2013: Walter Craig (Fields Institute and McMaster), *Waves and wave interactions: from small scales to very large*.

Feb 24, 2014: Hui Zhao (Dalhousie, Rowe School of Business and Tianjin University), *Optimal excess-of-loss reinsurance and investment problem for an insurer with jump-diffusion risk process under the Heston model*.

March 3, 2014: Justin Tzou (Dalhousie), *Slowly varying control parameters, delayed bifurcations, and the stability of spikes in reaction-diffusion systems*.

STATISTICS COLLOQUIUM

Organizer: Ed Susko

November 28, 2013: Michael Newton (Univ. of Wisconsin-Madison), *Two problems in high-dimensional statistics: a specific one on the analysis of gene function, and a general one on ranking and selection*.

March 13, 2014: Chris Field (Dalhousie), *Thinking about Multinomial Time or Space Series*.

April 3, 2014: Michael Rosenblum (Johns Hopkins University), *Optimal Tests of Treatment Effects for the Overall Population and Two Subpopulations in Randomized Trials, using Sparse Linear Programming*.

April 10, 2014: Fahimah A. Al-Awadhi (Dalhousie), *Bayesian Reconstruction using a Multi-scale Template Method For Shape Detection*.

@CAT SEMINAR

Organizer: Bob Paré

The Atlantic Category Theory and Algebra Seminar has been meeting weekly since the early 1970's with the participation of mathematicians representing most Atlantic Canadian universities, from time to time. In recent years the seminar has met on Tuesdays from 2:00 pm onwards, with ongoing attendance from Dalhousie, Saint Mary's, Mount Allison, and Acadia.

Organizer: Bob Paré

September 10, 2013: Geoff Cruttwell (Mt. Allison), *Tangent categories, vector bundles, and connections I*.

September 17, 2013: Geoff Cruttwell (Mt. Allison), *Tangent categories, vector bundles, and connections II*.

September 24, 2013: Dorette Pronk, *Mapping orbifold*s.

October 1, 2013: Toby Kenney, *Distributing over non-existent suprema*.

October 8, 2013: Richard Wood, *Big Categories and Big Limits – an introduction to cototal categorie*s.

October 15, 2013: Richard Wood, *Big Categories and Big Colimits – an introduction to total categories*.

October 22, 2013: Margaret Beattie (Mt. Allison), *Quantum lines for dual quasi-bialgebras*.

October 29, 2013: Jeff Egger, *Groupoids in non-commutative geometry, part 1: revisiting Mackey's 'virtual groups'*.

November 5, 2013: Jeff Egger, *Groupoids in non-commutative geometry, part 1.5: Continuing to revisit Mackey's 'virtual groups'*.

November 12, 2013: Bob Rosebrugh (Mt. Allison), *Symmetric lenses and spans*.

November 19, 2013: Toby Kenney, *Spin homomorphisms and classification of STB posets*.

November 26, 2013: Bob Paré, *Semidirect and bicrossed products of groups and things*.

December 3, 2013: Bob Paré, *Yetter- Drinfeld modules*.

January 7, 2014: Jeff Egger, *Enriched dagger categories of Hilbert spaces, part 1*.

January 14, 2014: Jeff Egger, *Enriched dagger categories of Hilbert spaces, part 2*.

January 21, 2014: Jeff Egger, *Enriched dagger categories of Hilbert spaces, part 3*.

February 25, 2014: Gábor Lukács, *Bornologies in topology, topological algebras, and their dualities I*.

March 4, 2014: Gábor Lukács, *Bornologies in topology, topological algebras, and their dualities II*.

March 11, 2014: Gábor Lukács, *Bornologies in topology, topological algebras, and their dualities III*.

March 18, 2014: Bob Paré, *Duoidal Categories*.

April 1, 2014: Bob Paré, *Duoidal Categories (continued)*.

April 29, 2014: Toby Kenney, *Completely Distributive Partial Lattice Complete Partial Ord*ers.

May 6, 2014: Jeff Egger, *Preliminaries to the social life of generalised Hilbert objects*.

May 13, 2014: Jeff Egger, *On the social life of generalised Hilbert objects*.

GRAPH THEORY SEMINAR

Organizer: Elham Roshanbin

July 3, 2013: Suzanne Seager (MSVU), *Locating a Relaxed Robber*.

October 2, 2013: Elham Roshanbin, *A game on graphs (based on a model for the diffusion of influence through social networks)*.

October 23, 2013: Jeannette Janssen, *Random discrete structures*.

October 29, 2013: Meng He (Faculty of C.S.), *A Brief Introduction to Computational Complexity and Data Structure Lower Bounds*.

November 6, 2013: Theodore Kolokolnikov, *Algebraic connectivity of trees and other graphs*.

February 12, 2014: Svenja Huntemann, *Connecting Combinatorial Algebra and Combinatorial Game Theory*.

February 19, 2014: Huda Chuangpishit, *Uniform linear embedding and random graphs*.

February 26, 2014: Lucas Mol, *On independence polynomials of Cartesian product graphs*.

MATHEMATICS HONOURS SEMINAR

This seminar serves the dual role of featuring talks by faculty geared towards an undergraduate audience, and giving honours students the opportunity to give talks on their honours projects.

Organizer: David Iron

Faculty talks:

Theodore Kolokolnikov: *Erdös-Rényi random graphs*.

Peter Selinger: *The Potrace algorithm*.

Jeannette Janssen: *Counting trees*.

Karl Dilcher: *Log tables and slide rules: How we calculated before there were calculators*.

Keith Taylor: *The Banach-Tarski Paradox*. (2 talks).

Student talks:

Elle Andersen-Aitken: *Model of Dune Formation*.

Paul Chavy-Waddy: *In the system of differential equations presented by Galante, Levy (2012)*.

Dario Brooks: *Invariant Classification of Four-Dimensional Neutral Signature Metrics*.

Nathan Musoke: *Holonomy of 4-Dimensional Neutral Signature Metrics*.

Alaa El Masry: *Google's PageRank Algorithm*.

Travis Russell: *Problems in Quantum Computation*.

John Mullins: *Safe Regions Produced by the Simple Pursuit-Evasion Game*.

Julia Tufts: *Network Reliability and the Reliability Polynomial*.

Zhuojing Zhang: *A mathematical model for options pricing.*

Melanie Foerster: *On Higher-Order Cycloidal Curves*.

NUMBER THEORY SEMINAR

Organizer: Rob Noble

January 29, 2014: Abdullah Al-Shaghay, *The Local-Global Principle: A Brief Introduction to the p-adic Numbers*.

March 19, 2014: John Cosgrave (Dublin, Ireland), *Gauss factorials, Jacobi primes, and prime factors of generalized Fermat numbers*.

April 9, 2014: Karl Dilcher, *Zeros and irreducibility of polynomials with gcd powers as coefficients*.

OUTSIDE TALKS

Graduate students, postdocs, and faculty members presented a large number of talks nationally and internationally, at conferences and at department seminars and colloquia. Below is a list which is probably not complete.-*kd*

Ali Alilooee:
When is a Square-Free Monomial Ideal of Linear Type, CMS Summer Meeting, Halifax, June, 2013.

Jason Brown:
Colourful Problems in Combinatorics, CanaDAM 2013 conference, Memorial University, June 10, 2013.

The Connections Between Mathematics and Music, Shad Valley, Dalhousie University, July 18, 2013.

A Hard Day's Math: The Connections Between Mathematics and Music, public lecture, inaugural talk for Dean of Science's Lecture Series, Ryerson University, Toronto, October 3, 2013.

Creativity in Mathematics, The Creative Process, Dalhousie University, January 30, 2014.

The g-Convexity of Graphs, Graphs and Algorithms Workshop, Fields Institute, Toronto, May 6, 2014.

Hermann Brunner:
Recent progress in theory and numerical analysis of Volterra integral equations (plenary talk), 4th International Conference on Approximation Methods and Orthogonal Expansions, University of Tartu, Estonia, May 27-30, 2013.

Numerical analysis and computational solution of integro-differential equations (plenary talk), 25th Biennial Conference on Numerical Analysis, University of Strathclyde, Glasgow, Scotland, June 25-28, 2013.

Michael Butler:
Michael is Hong Gu's M.Sc. student, but is in the Faculty of Medicine. He gave 14 talks this past year – too numerous to list them here.

Stuart Carson:
Spatial Analysis of at sea encounters among Sable Island Grey Seals (poster presentation), OTN Symposium, Halifax, June 3-5, 2013.

Danielle Cox:
All Terminal Reliability & Optimality, CanaDAM, Memorial University, June 10-13, 2013.

Karl Dilcher:
Sums of reciprocals modulo composite integers, 21st Czech and Slovak International Conference on Number Theory, Ostravice, Czech Republic, September 2-6, 2013.

A mod p³ analogue of a theorem of Gauss on binomial coefficients, invited talk, AustMS Annual Meeting, Sydney, Australia, Sept. 30, 2013.

Reducibility and Irreducibility of (0,1) Stern Polynomials, invited talk, Number Theory Down Under, Newcastle, NSW, Australia, Oct. 5, 2013.

Stern polynomials, Fibonacci numbers, and continued fractions, Colloquium talk, Univ. of Newcastle, Australia, Oct. 10, 2013.

Stern polynomials, continued fractions, and two theorems of Gauss, Number Theory Seminar, Univ. of Illinois, Urbana, IL, February 20, 2014.

Stern polynomials, Fibonacci numbers, and continued fractions, Colloquium talk, Tulane University, New Orleans, LA, March 27, 2014.

Zeros and irreducibility of polynomials with gcd powers as coefficients, invited talk, AMS Central Sectional Meeting, Lubbock, TX, April 13, 2014.

Zeros and irreducibility of some classes of special polynomials, invited talk, Workshop in Honour of David Borwein, SFU, Burnaby, BC, April 16, 2014.

Aysel Erey:
(Restrained) Chromatic Polynomials, CanaDAM Conference, St. John's, NL, June 13, 2013.

Nursel Erey:
Betti Numbers of Edge Ideals Using the Taylor Complex (Poster Presentation), CMS Summer Meeting, Halifax, June 5, 2013.

Multigraded Betti Numbers of Simplicial Forests, Combinatorial Algebra Meets Algebraic Combinatorics, Conference, Dalhousie, January 24, 2014.

Sara Faridi:
Counting the Projective Dimension of Graphs, Mathematical Congress of the Americas, Guanajuato, Mexico, August, 2013.

The combinatorics of Betti numbers, AMS Fall Southeastern Sectional Meeting, University of Louisville, Louisville, KY, October, 2013.

Counting the Projective Dimension of Graphs, Union College Mathematics Conference, Schenectady, NY, October, 2013.

Chris Field:
Estimating Bird Abundances: Approaches and Issues, invited talk, SSC Annual Meeting, Edmonton, May 2013.

Hong Gu:
Development of an Adequacy-Test for the DNA Substitution Models in Phylogenetic Analysis, invited talk, IMS-China International Conference on Statistics and Probability, Chengdu, China, June 30 - July 4, 2013.

Svenja Huntemann:
Combinatorial Games and Simplicial Complexes, Poster Presentation, CMS Summer Meeting, Halifax, June, 2013. (AARMS Award for best poster!)

Simplicial Complexes and Monomial Ideals of Placement Games, Science Atlantic Mathematics, Statistics, and C.S. Conference, Charlottetown, PEI, October 19, 2013.

Connecting Combinatorial Algebra and Game Theory, Combinatorial Algebra Meets Algebraic Combinatorics, Halifax, January 24, 2014.

David Iron:
Lattice patterns in the periodic Gierer-Meinhardt system, CMS Summer Meeting, Halifax, June 4, 2013.

Dynamics of a model of signal transduction in a 3 dimensional domain, AARMS Mathematical Biology Workshop, Memorial University, July 29, 2013.

Jeannette Janssen:
Finding the hidden space behind complex networks: an approach using the new theory of graph limits, Department Colloquium, UNB, Fredericton, Oct. 9, 2013.

Keith Johnson:
Rational polynomials that are integer valued at the Fibonacci numbers, University of Picardie, Amiens, France, November 18, 2013.

Toby Kenney:
Graphical Composition, Third International Symposium on Groups, Algebras and related topics, Beijing, China, June 12, 2013.

Chris Levy:
Dynamics and Stability of a 3D Model of Cell Signal Transduction with Delay, CMS Summer Meeting, Halifax, June, 2013.

Joanna Mills Flemming:
Modelling and Prediction for Clustered Count Data with Excess Zeros, 23rd Annual Conference of the International Environmetrics Society, Anchorage, Alaska, June 2013.

Rob Milson:
A Conjecture on Exceptional Orthogonal Polynomials, Seminar at U. Carlos III, Madrid, Spain, September, 2013.

Hermite polynomials and their generalizations, Colloquium at Baylor University, Waco, Texas, November, 2013.

Reduction of the NP formalism to 3-dimensional geometry, Seminar at Friedrich-Schiller-Univ., Jena, Germany, February, 2014.

Rational extensions of the quantum harmonic oscillator and exceptional Hermite polynomials, Seminar at Centre de Recherches Mathématiques, Montréal, March, 2014.

Richard Nowakowski:
Game Profiles, CMS Summer Meeting, Halifax, June 5, 2013.

Placement Games, Games-at-Dal, Workshop VII, June 12, 2013.

An Introduction to Combinatorial Game Theory, Invited Lecture, West Chester University, March 27, 2014

Temperature of Placement Games, TRU Games Workshop, Thompson River University, Kamloops, BC, May 6, 2014.

Bob Paré:
Comonoids in Rel, Session in honour of Luzius Grünenfelder, Dalhousie, June 3, 2013.

The 'Triple Category' of Bicategories, CMS Summer meeting, Halifax, June 6, 2013.

Dorette Pronk:
Weakly globular double categories of fractions, Category Theory 2013, Macquarie University, Sydney, Australia, July 12, 2013.

Orbi Mapping Spaces, Union College Mathematics Conference, Schenectady, NY, October 19, 2013.

Orbi Mapping Spaces, invited talk at the Transpennine Topology Triangle Seminar, University of Leicester, November 23, 2013.

Weakly Globular Double Categories: a New Model of Weak 2-Categories, Algebra Seminar, University of Edinburgh, April 22, 2014.

Elham Roshanbin:
A game based on a model for the diffusion of influence through social networks, Science Atlantic Mathematics, Statistics and Computer Science Conference, UPEI, Charlottetown, October 18-20, 2013.

Neil Ross:
A formalization of the Quipper quantum programming language, 2014 TYPES Meeting, Paris, France, May 2014.

Peter Selinger:
Efficient Clifford+T approximation of single-qubit operators, 21st Workshop on Foundational Methods in Computer Science (FMCS 2013), Sackville, NB, May 31 - June 3, 2013.

Efficient Clifford+T approximation of unitary operators, invited talk, 10th International Workshop on Quantum Physics and Logic (QPL 2013). Barcelona, July 17-19, 2013.

Introduction to categorical logic (4 lectures), Summer School on Topology, Algebra and Categories in Logic, Nashville, TN, July 24-27, 2013.

Control categories and duality. Invited participant, CRM workshop "From categories to logic, linguistics and physics: a tribute for the 90th birthday of Joachim Lambek". Montreal, Sept. 21, 2013.

Optimal ancilla-free Clifford+T approximation of z-rotations. Invited participant, Aspen Winter Conference on Advances in Quantum Algorithms and Computation. Aspen, Colorado, March 9-14, 2014.

Overview on categories in quantum theory. Dagstuhl Perspectives Workshop on Categorical Methods at the Crossroads, Dagstuhl, Germany, April 28-May 2, 2014.

Number-theoretic methods in quantum information theory (3 lectures). CAP Spring School on Quantum Structures in Physics and Computer Science, Oxford, May 19-22, 2014.

Generators and relations for the Clifford groupoid, Conference in honour of Prakash Panangaden on the occasion of his 60th birthday. Oxford, May 23-25, 2014.

Roman Smirnov:
Algebraic aspects of orthogonal coordinate webs, CMS Summer Meeting, Halifax, June 4-7, 2013.

Orthogonal coordinate webs in spaces of constant curvature, International Conference AMMCS-2013, Waterloo, Ontario, August 26-30, 2013.

Keith Taylor:
A Fourier Transform and the C*-algebra of Crystal Groups, Conference on Symmetries of Discrete Systems and Processes, Děčin, Czech Republic, July 16, 2013.

Harmonic Analysis on Crystal Groups, Colloquium, Mathematics Institute of the Technical University of Berlin, November 13, 2013.

Higher Dimensional Wavelet Transforms, Seminar for Shearlets Research Group, Technical University of Berlin, November 16, 2013.

Generalizations of the Continuous Wavelet Transform, A short course at Pavlodar State University, Pavlodar, Kazakhstan, March 4-27, 2014.

Foundations of Wavelet Theory, Colloquium, Eurasian National University, Astana, Kazakhstan, March 13, 2014.

Generalized Wavelet Transforms, Talk in the Thematic Program on Abstract Harmonic Analysis, Banach and Operator Algebras, Fields Institute, Toronto, April 16, 2014.

Justin Tzou:
Slowly varying control parameters, delayed bifurcations, and the stability of spikes in reaction-diffusion systems, Canadian Society of Applied and Industrial Mathematics Annual Meeting, Saskatoon, SK, June 2014.

Celeste Vautour:
Diffusion Through Social Networks in a Competitive Game Setting, Science Atlantic Mathematics, Statistics and Computer Science Conference 2013, UPEI, Charlottetown, Oct. 19, 2013.

Richard Wood:
The waves of a total category and total distributivity, Foundational Methods in Computer Science, Mt. Allison University, May 31 - June 1, 2013.

The waves of a total category and total distributivity, Conference in Memory of Aurelio Carboni, Milan, Italy, June 24-26, 2013.

Waves and totally distributive categories, International Category Theory 2013, Macquarie University, Sydney, Australia, July 7-13, 2013.

Ximing Xu:
State-space modelling of fish maturities, 2013 Annual Meeting of the Statistical Society of Canada, University of Alberta, Edmonton, May 28, 2013.

BRAIN TEASERS
Edited by
Dr. S. Swaminathan

1.   Prove that no palindrome integer, except 11, with an even number of digits can be a prime.

 2.   Read the following and do the **F** test given below:
Special Sale: Back issues of Issac Asimov's Science Fiction Magazine. All different! $1.50 each. The science fiction stories and science facts articles in Issac Asimov's Science Fiction Magazine are the product of years of scientific study, followed by years of writing experience. **F** test: Count all the f's in the sentences of the special sale.

3.   What is the longest word in 'the English language'?

Note: It is not some old joke answers: *rubber*, because if it isn't long enough, you can stretch it; *smiles*, because there is a mile between the first and the last letter; *beleaguer*, because there is a league between the first two and the last letters; *endless*, because there is no end to it. And the answer is in every pocket dictionary.

 4.   Solve the addition cryptarithm:

$$
\begin{array}{l}
\text{M A R S} \\
\text{V E N U S} \\
\text{S A T U R N} \\
\underline{\text{U R A N U S}} \\
\text{N E P T U N E}
\end{array}
$$

 [Solutions will be posted in the department website: *www.mathstat.dal.ca* **]**