DALHOUSIE UNIVERSITY

CHASE REPORT

Department of Mathematics and Statistics

May 2015

CONGRATULATIONS

AWARD WINNERS

Sir William Young Gold Medal in Mathematics

Benjamin Potter

University Medal in Statistics

Julie Melansen

Ralph & Frances Lewis Jeffery Scholarship

Benjamin Potter
And
Islay Wright

Barry Ward Fawcett Memorial Prize

Emma Carline

Ken Dunn Memorial Prize

Hayley Tomkins

Katherine M. Buttenshaw Prize

Hayley Tomkins

Waverly Prize

Nicole Easton

Emil and Stella Blum Award in Mathematics

Shael Brown

Ellen McCaughin McFarlane Prize

Shael Brown

Bernoulli Prize

Moira MacNeil

Professor Michael Edelstein Memorial Graduate Prize

Ben Cameron

Heller-Smith Scholarship

Yihao Yin

Field Prize in Statistics

Yiqun Liu

Geddes Fillmore Award

Yannick MacMillan

Undergraduate Research Awards

David Isenor (Richard Nowakowski)
Emma Carline (Keith Taylor)
Hayley Tomkins (Karl Dilcher)

HONOURS STUDENTS

Honours - Mathematics

Jana Anderson-Aiken
Jorge Goldschmied Chale
Shoulong Li
Gordon Byron (with Marine Biology)
Justine Gautier (with Economics)
Ben Potter (with Economics)
Marc Cormier (with Physics)
William Musgrave (with Physics)
Alyson Spitzig (with Physics)
Thomas Cromwell (with Statistics)
Andrew Beattie (with Psychology)

Honours - Statistics

Brandon Foote (with Economics)
Julie Melanson (with Economics)
Abdi Mohamed (with Economics)
Thomas Cromwell (with Mathematics)

NSERC AWARD WINNERS

CGS – D3 *Dylan Day*

NEW KILLAMS

Xiaoning Bian

KILLAM RENEWALS

Ali Alilooee
Svenja Huntemann
Antonio Vargas
Kim Whoriskey

GRADUATE STUDENTS

October 2014 Convocation:

Mathematics

Seth Greylyn
Ben Cameron

Statistics

David Fay
Yun Cai
Shen Ling
Michael Butler
Hungqun Chang

CHAIR'S MESSAGE

by Bruce Smith

Congratulations to all of our graduates. Convocation Day is a special time to celebrate your hard work and achievements. Special congratulations to those of you who have distinguished yourselves through receipt of honours and prizes, as indicated above.

Congratulations:
- to **Michael Dowd**, **Sara Faridi**, and **Theodore Kolokolnikov**, all of whom were recently promoted to Full Professor.
- to **Edward Susko**, who was recently appointed a Killam Professor. These Professorships recognize the careers of our most outstanding scientists. Ed's award recognises his superb contributions to both statistical theory and phylogenetic inference.
- to **Dorette Pronk**, on the successful renewal of her NSERC Discovery grant
- to **Peter Sellinger**, on his receipt of a major five year research contract

Changes:
Thanks to **Sara Faridi**, who steps down as Mathematics graduate coordinator on June 30. Since becoming grad coordinator in 2009, Sara has made substantial contributions to our graduate programs, including evelopment of our graduate handbook, streamlining of processes, and generally being a tireless advocate for graduate students.

Thanks to **David Iron**, who will be stepping down as Mathematics honours advisor on June 30. During David's time in this role, the Mathematics honours program has seen continual growth. David will be jumping from the frying pan to the fire, as he takes over as Mathematics graduate coordinator on July 1. **Keith Johnson** will take over as Mathematics honours advisor from July 1 through June 30, 2016.

Thanks to **Peter Selinger**, who steps down as Director of Mathematics on July 1, and to **Karl Dilcher**, who has been interim Director of Mathematics during Peter's recent leave. **Roman Smirnov** will begin as Director of Mathematics beginning July 1.

Richard Wood retired on July 1, 2014. The retirement was in name only, as Richard continues to be active in research and graduate supervision.

Special thanks to **Paula Flemming**, who recently retired after 42 years of service to Dalhousie, all of which were in the Department of Mathematics and Statistics (previously the Department of Mathematics, Statistics and Computer Science). You will find Queena's note about Paula elsewhere, but I would like to add my own brief comment. Since I came to Dalhousie in 1988, Paula has been the constant in the Department - always willing to take time to help solve a problem, and always with a smile! For all of us who have had to navigate the "graduate studies waters" - graduate students, supervisors, and graduate coordinators alike - Paula has made the experience a much more pleasant one. You will be missed, Paula.

Highlights:
In June, 2014, the university announced a donation of $500,000 from Eastlink to the Department to support the "**Nova Scotia Math Circles**" program (http://kil-cmdu-.its.dal.ca/?q=node/346) which will allow the expansion of the program's province-wide outreach activity. The past year's Math Circles activities are detailed below.

The Government of Nova Scotia recently announced an expansion of **AARMS** funding. This increased funding has allowed the organization to expand its initiatives and increase the outreach activities that they undertake. More details on this funding is included in the AARMS Report.

Upcoming events:
There are several notable upcoming events, including the Black Educators Association Summer Math Camp, the Canadian Mathematical Society Summer Math Camp, and the AARMS-PIMS Summer School (this

year featuring Differential Equations and Numerical Analysis), all in July. The Chase building will be hopping! Dalhousie will host the Statistical Society of Canada annual conference in June and the International Conference on Abstract Harmonic Analysis in August.

The Facility:
We are continuing to refurbish graduate offices on the 2nd and 3rd floors. We are currently at capacity in terms of room occupancy, and in particular, with respect to office space for graduate students. Over the past year our serial collections, where not already duplicated in the Killam library, were moved to the Killam, which has opened up space in room 008. This room is targeted as additional space for graduate students. Some students will be moving there over the summer and we will soon begin developing a longer term renovation plan for the room.

Programs and Curriculum:
In the past year we signed agreements with the 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. Ten students from SUFE entered the 3rd year of the Statistics program in fall, 2014. In fall, 2015, we are expecting Mathematics students from Tianjin and additional Statistics students from SUFE.

In the past year the departmental Curriculum Committee developed separate honours streams in Pure and Applied Mathematics. Students who are interested primarily in Applied Mathematics now have the opportunity to do an honours degree in Mathematics.

Our proposal for a BSc program in Actuarial Science is working its way through the approval process, and we are hopeful that we will be able to offer the degree in the 2016-2017 academic year. In the meantime, we have begun offering new courses for the program, with two third year courses running for the first time in winter, 2015, and two fourth year courses scheduled for fall, 2015.

Thanks to the many individuals - students, faculty, and staff – who are responsible for the diverse activities of our department. Special thanks to Angela, who keeps our facility the best on campus, to Balagopal, who keeps us on the leading edge technologically, and to Ellen, Maria, Paula (sadly, for the last time) and Queena, who run the ship.

MATHEMATICS DIVISION

By Karl Dilcher

The directorship of the Mathematics Division is currently in a state of transition. After Rob Milson (whose term ended June 30, 2014) brought long-term stability to the Division, Peter Selinger continued along this steady course and contributed to future stability by writing an excellent 16-page "Handbook for the Director of Mathematics". He also left me, as his 6-month sabbatical replacement, some meticulous notes and spreadsheets which were extremely helpful.

A few changes to the curriculum came on line with the current academic year, most notably the introduction of an Applied Mathematics stream within our Mathematics honours program. As part of this, the two main third-year honours courses (formerly MATH 3500 - Intermediate Analysis, and MATH 3030 – Abstract Algebra) were each split into two half course, MATH 3501/3502 and 3031/3032, respectively. The members of our Algebra group also took this as an opportunity to redesign and harmonize the course contents of the four-course sequence MATH 3031, 3032, 4045, and 4055.

Keith Johnson will be the new Mathematics Honours Coordinator. He replaces **David Iron** who will be the new Mathematics Graduate Coordinator, after Sara Faridi's term will have ended on July 1st.

I thank Bruce Smith and Rob Milson, as well as Peter Selinger (from his sabbatical leave in Germany) for their continuous help and advice during this term. **Roman Smirnov** will be the new Director as of July 1st. I wish him success and fulfillment in this important position.

STATISTICS DIVISION

by Hong Gu

This is the first year that the 2+2 program is active. In September 2014, ten students from Shandong University of finance and economics (SDUFE) started their third year major in statistics. Among these ten students, one was from the Mathematics school of SDUFE and the remaining nine transferred from the 2+2 Economics program. As expected, some students transferring from the economics program were less well prepared for the major in statistics. But I am happy to report that almost all students have succeeded in their course works in this year, some of them became top students. We are looking forward to the arrival of a similar number of students from SDUFE and possibly several 2+2 students from Tianjing University in 2015/16.

The Actuarial Science program proposal is going well. The proposal document has been completed and approved by a subcommittee of the Senate Academic Programs and Research Committee. It is due to be considered by the full committee in the very near future. After it is approved by this committee, it needs to be given final approval from the Senate, and can then be submitted to the Maritime Provinces Higher Education Council (MPHEC). We expect it to be submitted in the next few months.

Meanwhile, we have begun offering the new courses for the program. Two new courses, Actuarial Models I, and Life Contingencies I, were offered in the winter term this year. They proved very popular, both with enrollments of around 30 students. Another two courses, Actuarial Models II and Life Contingencies II will be offered for the first time in the fall term next year.

With the 2+2 program up and running and the attraction of the new actuarial science courses, the enrollment of all our third year level classes have dramatically increased. For example, the enrollments of STAT 3340. STAT 3360, STAT 3380 and STAT 3460 are 52, 51, 62 and 40 respectively.

Our graduate program also has been a big success in 2014/15. Eight new MSc students and three PhD students started their exciting new journey in September 2014. Among them, two students are funded by NSERC and Killam scholarships. We have also been successful in getting three PhD level and three Master level Nova Scotia research and innovation graduate scholarships. All these have contributed greatly to the attraction of FGS funding for the coming year and the possible success for the next year's graduate program in statistics.

Dalhousie is hosting the 2015 Annual Meeting of the Statistical Society of Canada. This is the largest gathering of statisticians in the country with an anticipated attendance of approximately 500 people. The conference will take place June 14-17. Ed Susko is the Chair and local organizer. The 2015 SSC student conference is going to be on Saturday June 13th before the SSC annual meeting. Our PhD student Lihui Liu is the local organizer for the SSC student conference. Congratulations goes to **Ed Susko** who has been awarded a Killam Professorship by the Faculty of Science, in recognition of a successful career within the faculty who have made great contributions to their fields. **Chris Field**, professor Emeritus, enjoys the immense freedom in time and hobbies while still is very active in research and graduate students supervision. In August 2014, Chris and Ximing Xu (Postdoc fellow working with Chris) attended the International Conference on Robust Statistics in Halle, Germany and

Ximing presented their research on robust state space models in fisheries. Chris Field also gave a seminar at the University of Geneva in October on analysis of marine microbial data and was an academic visitor at the Australian National University from November 15th to December 15th. In April 2015, Chris gave a presentation on fisheries data at the Workshop on Spatial/Temporal Data at the Fields Institute.

We welcome the arrival of new postdoc fellows, William Aeberhard and Marie Auger-Methe. William joined our group on February 1, 2015 and is supported by the CANSSI grant to work on robust methods in state space models for fisheries. William has a joint PhD in Statistics from the University of Geneva and the University of Sydney. Marie works with Joanna Mills Flemming.

Christophe Herbinger has his half year sabbatical leave in the summer and fall of 2014.

AWARDS DAY SPEAKER

Georg Hofmann received his Ph.D. in Mathematics from the Technische Universität Darmstadt (Germany). During a 3-year postdoc position at Dalhousie University he continued his research and taught a variety of courses. After that he started working in the Reinsurance Industry. In his latest position as a principal data scientist he works for Validus Research Inc. from his Halifax home office.

THE CHASE FAMILY

The Chase family was very active last year but as with all things there are busy periods and then we slow down a bit. In 2014/15 everyone seemed to be enjoying their new additions to their families and other changes in their lives.

Have a happy summer! -qcs

DEPARTMENT RETIREMENTS

A Turn in the Road

On July 1, 2014, **Richard Wood** said goodbye to faculty life and embarked on the open road of retirement. Richard began his Dalhousie life as a Ph.D. student and despite brief periods of absence he always returned to Dalhousie. He was welcomed as a faculty member in 1980 and has been an active member of the Department ever since. A reception was held for Richard at the University Club with many friends, family, former and current students, and colleagues in attendance.

Richard, you cast a long shadow and the lack of your presence in the Department will be felt. But we are sure you are enjoying every minute of your new life. - qcs

Farewell to an Icon

A Department reception was held in honor of **Paula Flemming's** retirement on Thursday April 30, 2015. We bid her a very fond farewell after 42 years here at Dalhousie. Her first 2 years were spent in the Faculty of Arts and Science before joining us in the Math and Stats Department, for the next 40 years. For the most part, Paula held the position of Graduate Secretary. She was that familiar and helpful face that all students would look for with their graduate problems and questions. Her knowledge and experience, was ever challenged with the many students coming and going over the past 40 years. This showed true, with her well-deserved nomination and receipt of the Rosemary Gill award in 2007.

Paula's genuine interest and caring for all the graduate students as they came through the Department was regularly acknowledged by the number of former students who would drop in to say "Hi" or send her updates on their life changes throughout the years.

She was a wealth of information and history for this department. She saw many changes in the university, our department offices, faculty and staff. As Paula moves to the next chapter of life after “Math and Stats”, we hope she will enjoy a very long, healthy and happy retirement. - el

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 2014/2015.

Urban Larsson has been with us for a year now as a Killam Postdoctoral Fellow, working 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.

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.

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. Ximing will be leaving us in August 2015 to take up a position as Assistant Professor at the Institute of Statistics, Nankai University, Tianjin, China. We wish him well.

Marie Augre-Methe arrived in August 2014 to work with Joanna Mills-Flemming in the Ocean Tracking Network. Marie comes to us from completing her PhD in Biology at the University of Alberta in Edmonton. She did her BSc and MSc in Biology at Dalhousie so is very familiar with our campus.

William Aeberhard is also working with Joanna Mills-Flemming and arrived in February, 2015. He is working on the Collaborative Research Team project “Advancement to State-Space Models for Fisheries Science” funded through the Canadian Statistical Sciences Institute / Fields Institute at the University of Toronto. William comes to us from Switzerland after finishing his BSc in Psychology and MSc in Statistics at the University of Geneva, and his PhD is Statistics jointly at the University of Geneva and University of Sydney, Autralia.

Additionally we will have 3 new Post Doctoral Fellows arriving in 2015.
Daniele Gregoris, a new AARMS PDF working with Alan Coley will be arriving in June from Italy.
Joep Evers will be arriving in September from Netherlands to work with Theodore Kolokolnikov in conjunction with Dr. Razvan Fetecau at Simon Fraser University.
Israel de Souza Rocha will be joining Jeannette Janssen in the fall of 2015 from Brazil.

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.

Karl Dilcher has the following people visiting and working with him throughout the year:
- **Christophe Vignat** (Univ. Paris-Sud and Tulane University), Aug. 8-22, 2014.
- **John Cosgrave** (Dublin, Ireland), Feb. 27 - March 22, 2015.
- **Larry Ericksen** (New Jersey), May 15 - June 3, 2015.

Richard Nowakowski was visited by **Carlos Santos** (Lisbon) and **Mike Fisher** (West Chester University) during the month of August while they assisted with his games workshop.

Huaichun Wang has continued working as a research assistant with Ed Susko and Andrew Roger of the Department of Biochemistry and Molecular Biology on statistical modelling of protein sequence evolution following the completion of his Postdoctoral Fellowship funded by the Center for Comparative Genomics and Evolutionary Bioinformatics. He received his Ph.D. in Biology at the University of Ottawa in 2005, and his research interests include Molecular Evolution and Bioinformatics.

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 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.

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.

Elias Krainski visited from the Department of Mathematical Sciences at NTNU during the week of January 12, 2015. He was working with Joanna Mills-Flemming and PhD students Stuart Carson and Aurelie Cosandey-Godin to apply Bayesian spatiotemporal models to complex marine observations.

Lerna Pehlivan is with us for an extended visit. She is working with Karl Dilcher.

IN MEMORIAM

Beatrice Tingley, wife of Arnold Tingley, former Chair to the Mathematics and Statistics Department, passed away on Christmas Day, 2014 at the age of 94. Their son, Daryl, has been in contact with us and the family remains a friend of the Department.

MATH KAGAROO CONTEST

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 32 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 29th in the Learning Centre, Colloquium Room and Seminar Room in the Chase Building. With 4196 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 2015:

this number of students is the maximum the Chase Building can hold! These young Nova Scotia Mathletes are scoring well, nationally: A Grade 7 student won 2nd place, and a Grade 4 student won 3rd place nationally, while 2 students placed in the Top 2%, 2 in the Top 5%, 4 in the Top 10% and 19 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/

The Putnam Competition
Dorette Pronk

The Putnam competition is an annual math competition for college students in North America. One of our graduating honours students, Scott Cameron, received a score of 21 points which put him in the top 20% of the students participating in this competition. Congratulations, Scott!

3.1415… AND ALL THAT

While Pi as a number remains constant (in the Euclidean metric at least), the annual Pi Day event keeps growing. Pi Day 2015 was dubbed “Super Pi Day” because of the inclusion of two more digits, 3.1415 represented by March 14/15. In keeping with the growth trend of this event, we were invited by the Lord Nelson to hold our festivities in their Georgian Lounge.

The Lord Nelson went all out for us with lots of gourmet pies, refreshments, contests and door prizes, even a pie-in-the-face for some key members of the Department.

Marie–Andree B Langlois, President of DMSGA, worked with Michelle Burgess at the Lord Nelson and promoted the event on campus as well as inviting the Mathematics Departments from Saint Mary’s University and Mount St. Vincent University. It was a wonderful success with a variety of attendees from students to faculty to upper-level administration, 140 RSVPs and several additional drop-ins. –qcs

UNDERGRADUATE MATH CONFERENCE
Justine Gautier

The 2014 Canadian Undergraduate Mathematics Conference was hosted by Carleton University in Ottawa, Ontario. The Dalhousie team consisted of ten students, five of whom gave talks at the conference. The participants were Jana (Elle) Anderson-Aiken, Manisha Bali, Dario Brooks, Mikaela Deboer, Brandon Elford, Justine Gauthier, Mohammad Kidwai, Nathan Musoke, Kyle Macquin and Travis Russell. The student participants received travel funds through generous donations to Dalhousie's annual fund.

This year's CUMC will take place at the University of Alberta in Edmonton, June 17 - 21, 2015. Once again, we expect that a number of undergraduate students will attend this conference, again largely funded by the department through donations.
For more details, including abstracts of the student talks, see http://cumc.math.ca/2015/

COMPUTING RESOURCES

by Balagopal Pillai

The computing resources in the department, including the department machine room, operated without any major issues this past year.

The department machine room is expected to receive a major upgrade to the cooling equipment this financial year. All three units went through acid cleaning this year to remove scaling accumulated over the years. The compute cluster and other infrastructure services operated normally the past year. New storage and server deployments happened in Chase and Killam machine rooms. A wall mounted projector got installed on Chase Colloquium Room and it has functioned without issues so far.

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. 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.-*kd*

WALLACE MCCAIN LEARNING COMMONS

A few years ago Dalhousie received a major donation from the McCain family to build the "Wallace McCain Learning Commons". Construction was started on the west side of the Chase Building in June 2014 and is scheduled to be completed in the Fall of 2015. This will be a shared space for Dalhousie and the neighbouring community to come together. More information including architectural mock-ups can be found on the Dalhousie Facilities Management website under Campus Development. –qcs

(http://www.dal.ca/dept/facilities/campus-development/projects/wallace-mccain-learning-commons.html)

AARMS REPORT

by Jeannette Janssen

In the year 2014, AARMS reaped the rewards of concerted efforts to draw attention to the successes of the mathematical community in Atlantic Canada, and to garner support for AARMS so that this community can continue to thrive. In April, AARMS was notified of the outcome of the joint application of the Institutes to the NSERC-CTRMS program. The reports we received from the review committees contained ample praise for AARMS and strongly recommended continued funding for AARMS through the CTRMS grants to CRM, Fields and PIMS. Shortly after that, we received news that our application to the Research Development Corporation (RDC) of Newfoundland & Labrador had been successful.

There was also a positive response to our request for renewal of funding from the province of Nova Scotia. The provincial government substantially increased their contribution to AARMS. This has enabled us

to create a new post-doctoral fellowship at Dalhousie. As part of their position, the post-doc will help coordinate various Outreach activities supported by AARMS. In addition, the post-doc will do research with a faculty member in the department. We hope this will be a continuing position, which will be a great addition to the department.

The increased funds to AARMS were also used for an increase in our activities. In particular, we have expanded our post-doctoral program, our collaborative research group (CRG) program, and our funding for scientific and outreach events. Several members of our department are part of the AARMS CRG in Numerical Analysis and Scientific Computing, a very successful group whose funding was renewed for a further two years. Ending their term this year is a CRG in Graphs and Games, also well-represented in our department. A new CRG on the mathematical and physical aspect of Black Holes has just been awarded, and aims to increase collaboration between researchers in this field at Dalhousie and UNB.

The joint application process for the NSERC-CTRMS program led to increased collaboration with CRM, Fields, PIMS and CANSSI. With Fields, the main area of collaboration was in Algebra. With CANSSI, there was collaboration on Big Data. With PIMS, there is great synergy in the field of Dynamical Systems and Mathematical Biology. The directors of the five institutes communicate regularly, and we continue to explore new ideas for joint projects.

The summer school moved to Dalhousie in 2014, and will remain there for three years. The themes this year were Commutative Algebra and Statistics, and the directors were **Sara Faridi** and **Hong Gu**. Judging from the feedback through the survey we administered, the students were very pleased with the school. I attended the final event, and thus had the opportunity to judge that the students had cemented a strong bond over the four weeks of the school, both with each other and with the instructors and organizers. In 2015, the AARMS summer school will be offering courses in Numerical Analysis and Dynamical Systems. The director is **Theo Kolokolnikov**.

Each year, we thank **David Langstroth** for his service to AARMS. This year I want to put special emphasis on my gratitude. The new funding opportunities all come with their own application, review and reporting requirements; keeping track and making sense of all the details is a daunting task, but one which David performs with grace and good humour. I also want to acknowledge all the help Queena Crooker-Smith has given to AARMS in general, and the summer school in particular. Finally, thanks to the department for their continued support of AARMS.

THE AARMS SUMMER SCHOOL 2014

by Sara Faridi and Hong Gu

The AARMS Summer School was held July 21 to August 15, 2014 at Dalhousie University. The 2014 School concentrated on Algebra and Statistics. There were four courses offered at the beginning graduate level:

- *Gröbner Bases in Commutative Algebra*, Instructor: Dr. Giulio Caviglia , Purdue University
- *Homological Conjectures in Commutative Algebra*, Instructor: Dr. Hailong Dao , University of Kansas
- *Statistical Learning with Big Data*, Instructors: Drs. Hugh Chipman, Acadia University and Xu (Sunny) Wang, St. Francis Xavier University
- *Spatial Statistics*, Instructor: Dr. Julie Horrocks, University of Guelph.

Students attended from 13 different countries, each bringing with them their expertise and experiences. There were 22 Algebra students and 20 Statistics students.

The four weeks were spent in intense study along with homework, tutorials and problem

sessions. The lectures were engaging, covering a broad range of topics: from classic questions in Algebra that motivated decades of research to some of the most contemporary lines of thought in the field; from the most popular and powerful statistical and machine learning tools to Statistical Models for Spatial data arising in many fields, including geography, epidemiology, public health, ecology and climatology.

There were supplementary lectures in the algebra program by Jay Schweig of Oklahoma State University and Russ Woodroofe from Mississippi State University. They each stayed at the school for a week or more. It was a successful School where more than 86% of the students found the level of the courses were suitable for them, and more than 80% of the graduate students' thought the courses were relevant to their research. There was a welcome barbeque held in the courtyard of the Mini Rez houses to welcome the students from out of town and provide a chance for everyone to start to know each other. Also, a catered dance evening was held at St. Mary's Boat Club where the students could relax and enjoy some down time.

The students were treated to several outings showcasing various aspects of Nova Scotia. They went to the Kejimkujik National Park Seaside Adjunct. On the way there they stopped in Liverpool and on the way back had a chance to try some traditional fare at Lanes Privateer Inn. A glimpse of the Annapolis Valley was available on another weekend when they went to Annapolis Royal to tour the town and then stopped in Hall's Harbour for a traditional Lobster Dinner, tour of a lobster pound and a chance to see the spectacular view of the Bay of Fundy at low tide.

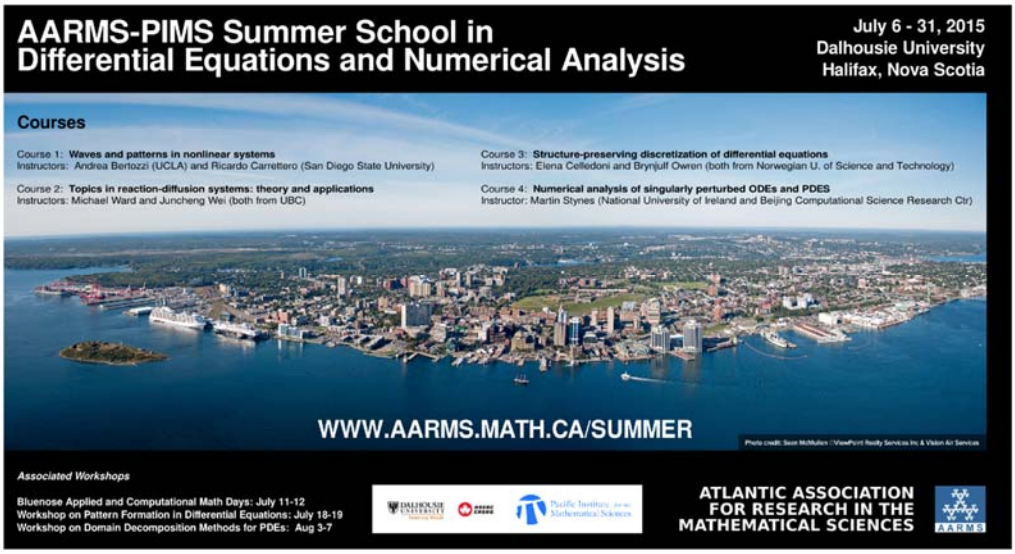
The School received funding from CANSSI, The Field's Institute, Dalhousie President's Office, and AARMS as well as support from the Mathematics and Statistics Department office staff.

AARMS SUMMER SCHOOL 2015

Another Summer School is scheduled for July 6 – 31, 2015. This year the major funding partners will be AARMS and PIMS (Pacific Institute for the Mathematical Sciences). The organizers for 2015 are Theodore Kolokolnikov and Hermann Brunner.

This year's summer school will be on Differential Equations and Numerical Analysis. This is a great opportunity for graduate students to learn more about cutting-edge research (moreover, the students get an academic credit for taking these courses).

The AARMS-PIMS Summer School in Differential Equations and Numerical Analysis will include the following courses:



- *Waves and patterns in nonlinear systems,* Instructors: Andrea Bertozzi and Ricardo Carrettero
- *Topics in Reaction-Diffusion Systems: Theory and Applications,* Instructors: Michael Ward and Juncheng Wei
- *Structure-preserving discretization of differential equations,* Instructors: Elena Celledoni and Brynjulf Owren
- *Numerical analysis of singularly perturbed ODEs and PDES,* Instructor: Martin Stynes

For more information or to register please see http://www.mathstat.dal.ca/~tkolokol/summer/ There is still space available for local students.

In addition to the summer school, AARMS is organizing three associated workshops in differential equations that the school participants are welcome to attend:
- Bluenose Workshop (July 11-12).
- Workshop on Pattern Formation in Differential Equations (July 18-19).
- Workshop on Domain Decomposition methods for PDEs (Aug 4-8).

TWO DOWN, TWO TO GO

As reported in previous years editions, 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. The SIAM Discrete Mathematics meeting in June, 2012, CMS meeting in June of 2013, and AMS meeting in October, 2014 were all very successful and well organized. This leads us to the upcoming SSC Annual Meeting.

The 2015 Annual Meeting of the Statistical Society of Canada is the largest gathering of statisticians in the country with an anticipated attendance of approximately 500 people. The conference will take place June 14-17. Ed Susko is the Chair and local organizer. The 2015 SSC student conference is going to be on Saturday June 13th before the SSC annual meeting.

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*

2014 Fall Eastern Sectional Meeting of the AMS

The 2014 Fall Eastern Sectional Meeting of the AMS was held at Dalhousie University on Oct 18-19, 2014.

The scientific program consisted of four invited lectures by Sujatha Ramdorai (UBC), William M. Goldman (Maryland), Sourav Chatterjee (Stanford), and François Bergeron (UQAM). There were also 14 special sessions:
* Advances in Harmonic Analysis and Partial Differential Equations (D. Cruz-Uribe, S. Rodney)
* Combinatorial Representation Theory (C. Ballantine, R. Orellana, M. Rosas)
* Commutative Algebra and Its Interactions with Algebraic Geometry (S. M. Cooper, S. Faridi, W. Traves)
* Differential Geometry and Mathematical Physics (V. Charette, K. Melnick)
* Experimental Mathematics in Number Theory, Analysis, and Combinatorics (M. Chamberland, K. Dilcher)
* Games on Graphs (J. Brown, J. Janssen, R. Nowakowski)
* Generalized Catalan Algebraic Combinatorics (F. Bergeron, F. Saliola, H. Thomas, N. Williams)
* General Relativity (J. Gegenberg, A. Coley, I. Booth, H. Kunduri, S. Seahra, V. Husain)
* Hopf Algebras (Y. Bahturin, M. Beattie, M. Mastnak)
* New Directions in Category Theory (P. Hofstra, D. Pronk)
* p-adic Methods in Arithmetic (H. Darmon, A. Iovita, S. Ramdorai)
* Sampling Theory

(J. J. Benedetto, J.-P. Gabardo, O. Yilmaz)
* Special Functions and Their Applications (M. E. H. Ismail, N. Saad)
* Symbolic Dynamics and Combinatorics on Words (S. Brlek, R. Yassawi)

Many of the special sessions were at the cutting edge of their respective research areas. Among the scientific successes, let me highlight the special session on Sampling Theory. It was considered a great success, and was also connected to the invited lecture by Sourav Chatterjee, who was also an invited speaker at the recent ICM in Seoul. Dr. Chatterjee's lecture, which was on the probability of rare events, was very well received.

The conference had 243 registered participants. This included 66 from the Atlantic Region (43 from Nova Scotia, 14 from New Brunswick, 6 from Newfoundland, and 3 from Prince Edward Island) and 61 from the rest of Canada. There were also 97 participants from the U.S., as well as 19 participants from other countries (Argentina, Barbados, Belgium, Brazil, France, Germany, Great Britain, Italy, Mexico, and Spain).
Funding was provided by AARMS, the AMS, Dalhousie President's Office, and Dalhousie's Faculty of Science.

CMS Summer Meeting at UPEI
Karl Dilcher

This year's CMS Summer Meeting at UPEI in Charlottetown (June 5-8, 2015) has stronger and closer connections with our department than possibly any other CMS meeting so far. Both Scientific Directors are Dalhousie alumni:
Shannon Fitzpatrick is a PhD graduate of ours, and Gordon MacDonald did his honours B.Sc. here. The public lecture ("Games: Playing Positions Purposefully") will be given by Richard Nowakowski. A number of special sessions are organized or co-organized by department members or alumi, in particular:

- Graduate Student Research Presentations (Svenja Huntemann)
- Games and Pursuit Games on Graphs (Richard Nowakowski)
- Graphs, Designs and Hypergraphs (Margaret-Ellen Messinger, Mt. Allison)
- Number Theory (Karl Dilcher)
- Undergraduate Student Research Presentations (Nathan Musoke, Waterloo).

Also, a good number of speakers are members or alumni from our Department:
- Abdullah Al-Shaghay - Number Theory
- Heinz Bauschke (UBC) - Optimization and Nonlinear Analysis
- Dario Brooks - Undergraduate Student Research Presentations
- Jason Brown - Graphs, Designs and Hypergraphs
- Ben Cameron - Graduate Student Research Presentations
- Nancy Clarke (Acadia) - Graphs, Designs and Hypergraphs
- Stephen Finbow (StFX) - Graphs, Designs and Hypergraphs
- Shannon Fitzpatrick (UPEI) - Graphs, Designs and Hypergraphs
- Svenja Huntemann (Games and Pursuit Games on Graphs)
- Keith Johnson - Number Theory
- Marie Langlois - Number Theory
- Gordon MacDonald (UPEI) - Operator Theory ..., C* Algebras
- Neil McKay (Games and Pursuit Games on Graphs)
- Karyn McLellan (StFX) - Number Theory
- Rebecca Milley (Wilfred Grenfell) (Games and Pursuit Games on Graphs)
- Rebecca Milley (Wilfred Grenfell) - Reaching our Students ...
- Lucas Mol - Graphs, Designs and Hypergraphs
- Rob Noble - Number Theory
- James Parks (Lethbridge) - Number Theory
- Elham Roshanbin - Graphs, Designs and Hypergraphs
- Matthew Stephen (Alberta) - Interplay of Convexity and Geometric Analysis

Furthermore, the following former postdocs and long-term visitors will also be giving talks:

- Berndt Brenken (Calgary) - C* Algebras
- Tatiana Hessami Pilehrood (Fields Institute) - Number Theory
- Michael Lamoureux (Calgary and PIMS, UBC) - Recent Advances in the Mathematics of Electromagnetic and Acoustic Imaging
- Mehdi Radjabalipour (U. Kerman) - Operator Theory...
- Gail Wolkowicz (McMaster) - Dynamical Systems...
- Henry Wolkowicz (Waterloo) - Optimization and Nonlinear Analysis

Of the 17 scientific sessions at the CMS meeting, 11 are co-sponsored by AARMS -- of course, the Director of AARMS is Jeannette Janssen.

WORKSHOPS

Richard Nowakowski held a mini games workshop in August with Urban Larsson PDF, Carlos Santos (Lisbon) and Mike Fisher (West Chester University).

Other news, Urban Larsson, Svenja Huntemann and Richard Nowakowski attended the first Combinatorial Games Workshop in Lisbon, January 18-22, 2015.

Number Theory Day

In conjunction with the AMS Sectional Meeting, a full day of number theory talks was held in our department on Monday, Oct. 20, 2014. The talks covered a broad spectrum of number theory, but a common theme was a more classical and experimental flavour to most talks. About half of the speakers were from other universities: Marc Chamberland (Grinnell College), Kevin Hare (Waterloo), Armin Straub (University of Illinois at Urbana-Champaign), Christophe Vignat (Univ. Paris-Sud and Tulane University), and Steven Weintraub (Lehigh University). The remaining speakers were from our department, namely **Marie Langlois, Lerna Pehlivan, Keith Johnson,** and **Karl Dilcher**.

NOVA SCOTIA MATH CIRCLES

by Svenja Huntemann

Math Circles had a great year!
We began last summer with a large announcement party on June 17, 2014. The Learning Centre was packed and overflowing into the hallway with regular attendees, their parents, members of the department, and many other supporters. And everyone was very excited about the big news delivered by our program director Danielle Cox, student Ian MacIntosh, university president Richard Florizone, provincial minister of education Karen Casey, and Eastlink CEO Lee Bragg: Eastlink is donating $500,000 to Math Circles over the next 5 years!
This new funding enables us to keep running our program, and even expand to include elementary schools! We are very grateful to Eastlink for this opportunity.

Our team this year consisted of Richard Nowakowski as continuing faculty advisor, and Danielle Cox as outgoing and Svenja Huntemann as incoming director. With partial support from the department, Ben Cameron and Elham Roshanbin were teaching assistants. The rest of our presentation team consisted of Bassemah Alhulaimi, Abdullah Al-Shaghay, Marie B. Langlois, Huda Chuangpishit, Brandon Elford, Justine Gauthier, Lucas Mol, Francisco Rios, Julien Ross, Holly Steeves, and Julia Tufts.

Our fall term this year was very busy, with up to four trips per week, as well as a weeklong trip to the Tri-County Regional School Board. The winter term was a bit quieter due to the harsh weather and the many resulting snow days.

As of the end of April, we have outreached to over 3000 students, giving 133 presentations at 21 different schools in five different school

districts with a few more trips planned before the end of the school year.

In addition to the schools, we worked with two homeschooling groups and visited a Girl Guides group. We had a table at the annual NS Math Teachers Association Conference, and gave two professional development workshops on using games for teaching math. And we participated in a new initiative by the Faculty of Science which showcased the different outreach programs within the faculty during Homecoming.

Our Discovery Days took place April 27th and 28th. We had 146 students visiting the Chase and learning about fun math. Despite doubling the number of slots offered from last year, we still had schools on the waitlist!

Our monthly local events attracted between 30 and 50 students. Several faculty members from our department (Peter Selinger, Dorette Pronk, Robert Milson, Karl Dilcher) volunteered to give very engaging talks. We also had/will have guest speakers from elsewhere, namely Michele Millar (MSVU), Philip Munz (Acadia), and Erick Lee (HRSB). The other months were filled with activities organized by several of our grad students.

For the summer we are planning to create new hands-on presentations for elementary and junior high schools covering curriculum outcomes as well as general mathematical skills, all possible thanks to the funding from Eastlink!

NOVA SCOTIA MATH LEAGUE

by John Irving (SMU)

The NS Math League has had a successful year! In April students and teachers from across the province partook 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 this year was Halifax West High School, followed by C.P. Allen and then King's Edgehill, Halifax West dominated the regular season this year so it's fitting that they won the finals.

Dr. John Irving of Saint Mary's University organized the contest with assistance from Mr. Andrew Hare (Saint Mary's University), Abdullah Al-Shaghay (Dalhousie), and Danielle Cox (Acadia). Svenja Huntemann (Dalhousie) also helped with the Provincial Finals.

MATH CAMP 2014 REPORT

by R.P. Gupta

The Dal-BEA Math camp for Black Students was held, July 6-12, 2014. Twenty Seven campers attended the camp. Sixteen were female and eleven male. They came from Junior high schools from all over Nova Scotia. On Sunday, July 6, 2014, parents brought the campers to Howe Hall, where registration and a reception are held. The campers and their parents were told about the expectation and responsibilities. They stayed in Howe Hall under the supervision of four chaperons - 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, Ms.Lynn Johnson, Mr. Preman Edward and Dr.Nauzer Kalyaniwalla.

On Monday afternoon the campers visited the museum and in the evening career night presentation was made by Paul Ash,Celeste Williams, Sandra Ceywin and Gay Jarvis. 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 Tuesday Campers went to the Black Cultural Centre and NSCC Campus in Dartmouth, N.S. where Mr. Henry Bishop (Curator) gave a lesson on the history of African Nova Scotians and Mr. Gerry Clarke,

the Principal of the college described various programs offered by the college.

On Thursday night, the students were given a tour of the Discovery center where they engaged in several activities of science experiments.

On Friday, the closing ceremony took place, where prizes and certificates were distributed. Many campers openly discussed the benefit they received by attending the camp. 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 2015 BEA Math Camp will be having some extra celebrations as it is the 25th anniversary of the Camp and they have invited alumni to join them for a banquet.

DALHOUSIE-CMS MATH CAMP
July 6-11, 2014

by Roman Smirnov

As always during the second week of July, last year the Department of Mathematics and Statistics at Dalhousie University hosted the Dal-CMS math camp, whose goals were to identify, stimulate and encourage mathematical talent among Nova Scotia high school students. This outreach initiative aimed at Nova Scotia high school students has been growing in popularity. Every year we get inquiries from out-of-province students asking to participate in the camp.

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 organized by Danielle Cox, Caroline Cochran and Roman Smirnov. The following Faculty members and grad students volunteered to speak at the camp (with the titles of their respective talks in the parentheses):

Daniele Cox (Problem Solving Fun: An Exploration of Interesting Puzzles Throughout Mathematics),
David Hamilton,
Bruce Smith (Latin Squares, Sudoku, and Kenken),
Karl Dilcher (A Mathematical Mystery Tour: Large Numbers and Great Mathematicians),
Svenja Huntemann (Coding Theory and Related Math),
Srinivasa Swaminathan (Mathematical Tricks and Cubic Equations),
Chelluri Sastri (The Pigeonhole Principle),
Caroline Cochran (QED: An Introduction to Proofs),
Roman Smirnov (What is Mathematics?),
Richard Nowakowski (Cleaning a Graph: A Robot's Work is Never Done).

The students were chaperoned by Dario Brooks and Julie Tufts.

Last but not least, our great staff, Queena Crooker-Smith, Maria Fe Elder, Paula Flemming, Balagopal Pillai, and Ellen Lynch did a fantastic job, while helping us to organize the camp.

This year's math camp is being organized by Caroline Cochran and Roman Smirnov. Think about contributing to the camp as a volunteer speaker.

GRADUATE STUDENT SOCIETY

by Marie-Andree B Langlois

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 (Marie B.Langlois, president; Bassemah Alhulaimi, vice-president; Aysel Erey, secretary/treasurer; Lihui Liu, department representative; Darien DeWolf, Lett Bursary representative and Francisco Rios, DAGS representative). In the fall we had a pizza and board game night. For the whole year each month we would gather for coffee and on

occasion have an informal chat about our mathematical problems. In the winter term we celebrated Chinese New Year and Persian New Year.

Our annual Pi Day party was a big hit again with the department. The Lord Nelson Hotel offered to host the event for us, they took care of the food and entertainment and we advertised the event, to various Dal departments that use this number and the other universities in Halifax.

As fundraisers, we again organized end-of-term tutorials for first year calculus and statistics for both terms, which were very well attended. With the help of Pierre Stevens, we have run TA-evaluations on a volunteer basis, for those teaching tutorials who wanted to receive feedback.
For the summer, we so far have another games night and picnic planned, which we will add to as the term progresses.

THE UNDERGRADUATE MATHEMATICS AND STATISTICS SOCIETY (DUMASS)

by Justine Gautier

2014/2015 Council members:
President: Justine Gauthier
Vice President: Megan Douglas
Treasurer: Kyle MacQuin
Secretary: Mikaela Deboer
Communications officer: Brandon Elford
DSS Representatives: Ryan Ambrose, Dario Brooks, Chelsi Wicks

The Dalhousie Undergraduate Mathematics and Statistics Society had a fun and exciting 2014/2015 year! This year, more than ever, the executive council focused heavily on the creating an inclusive environment where students could socialize and meet with other students in the department. Our goal was to reach out to students in the department and make the society better known. Visiting classes, putting up more posters, and increasing our social media usage, helped achieve this goal.

The Undergraduate Society began the academic year with the annual meet and greet event. This event is a great opportunity for students to meet their professors in a stress-free environment. Also, the meet and greet is a good way for students to meet their classmates. The academic year was full of many social events for students in the department. This year saw more events with other societies in the faculty of science. The “Math-for- Econobrew” was popular among math and econ students. The society also teamed up with the physics department for one social. With so much academic overlap, this event was a great success. As always, the academic year came to a close with the annual Wine and Cheese.

This year the Undergraduate Society also helped with the annual Pi Day celebrations. This was a great event, which, thanks to the Lord Nelson, had a record high turn out. Many members of the department, as well as the community, came out to enjoy the number Pi.

This year’s DUMASS Executive Council would like extend a congratulations to all of the Mathematics and Statistics graduates, as well as wish them luck on their future endeavours. The council would also like to thank all those who attended events and helped to make the 2014/2015 year a success!

A warm welcome to the incoming Executive Council, and best of luck in the 2015/2016 year:
President: Brandon Elford
Vice President: Kyle Macquin
Treasurer: Todd Best
Secretary: Sohraub Pazuki
Communications officer: Luke DeCoffe
DSS Representatives: Sohraub Pazuki and Timma Flanagan

MATHEMATICS COLLOQUIUM

Organizer: Dorette Pronk

As in every year, the Mathematics Colloquium featured an interesting mix of talks from many areas of mathematics. I would like to thank all members of the Chase community who suggested speakers. This year's talks were:

October 17, 2014: Mourad E.H. Ismail (University of Central Florida and King Saud University) *2D-Orthogonal Polynomials*

October 27, 2014: Huaichun Wang (Dalhousie University) *Quantifying the stability of phylogenetic trees*

November 20, 2015: Abbas Mehrabian (University of Waterloo) *Bounds for randomized rumour spreading protocols*

February 12, 2015: Jan Feys (McGill University) *Elliptical Instability of the Moore-Saffman Model for a Trailing Wingtip Vortex.*

STATISTICS COLLOQUIUM

Organizer: Joanna Mills-Flemming

This year the Statistics Colloquium featured a nice collection of talks from many areas of statistics. This collection included well prepared and presented talks from three PhD students (Aurelie Cosandey-Godin, Elise Laende, Franziska Broell) as well as our two new postdoctoral fellows (Marie Auger-Méthé and William Aeberhard) . Suggestions of speakers for the 2015/2016 Academic Term are most encouraged and can be sent to Joanna.Flemming@Dal.Ca. Details of this year's talks are provided below.

October 9, 2014: Ximing Xu (Department of Mathematics and Statistics, Dalhousie University), *Robust State-Space Models For Fish Stock Maturities*.

October 23, 2014: Marie Auger-Méthé (Ocean Tracking Network - Department of Mathematics and Statistics, Dalhousie University), *Walking in their footsteps: understanding animal behaviour using statistical models and movement data*.

November 6, 2014: Aurelie Cosandey-Godin (Department of Biology, Dalhousie University), *Applying bayesian spatio-temporal models to fisheries bycatch: new computationally fast approaches*.

December 4, 2014: Elise Laende (School of Biomedical Engineering, Dalhousie University), *Radiostereometric analysis (RSA) for the evaluation of total joint replacements*.

January 22, 2015: Michael Dowd (Department of Mathematics and Statistics, Dalhousie University), *Estimation for Dynamical Systems: Applications in Ocean Biology*.

February 12, 2015: Franziska Broell (Department of Oceanography, Dalhousie University), *Challenges of animal activity recognition using accelerometer sensors*.

February 26, 2015: Ammar Sarhan (Department of Mathematics and Statistics, Dalhousie University), *A general overview of some research*.

March 2, 2015: Michael Rosenblum (University of California, Berkeley, and University of California, San Francisco, USA), *Analyzing Direct Effects in Randomized Trials with Secondary Interventions: An Application to HIV Prevention Trials*.

March 12, 2015: Gordon Flowerdew (Department of Community Health and Epidemiology, Dalhousie University), *Estimating the Hysterectomy Complication Rate: More complicated than I thought*.

March 26, 2015: William Aeberhard (CANSSI - Department of Mathematics and Statistics, Dalhousie University), *Attempt to Estimate the Mixing Distributions of Mixed Poisson Model*.

@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.

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

September 9, 2014: Dorette Pronk (Dalhousie), *Bicategories of Fractions Revisited*

September 16, 2014: Dorette Pronk (Dalhousie), *Bicategories of Fractions Revisited - Continued*

September 23, 2014: Dorette Pronk (Dalhousie), *Bicategories of Fractions Revisited Part 3*

September 30, 2014: Toby Kenney (Dalhousie), *More on Partial Sup Lattices*

October 7, 2014: Toby Kenney (Dalhousie), *Still more on Partial Sup Lattices*

October 14, 2014: Jeff Egger (Halifax), *Analytic structures overlying continuous maps*

October 21, 2014: Mitja Mastnak (SMU), Hopf day afternoon at SMU
Program:

1:30 - M. Beattie, Introduction to Hopf algebras
2:30 – G. Garcia, Categorical quantum subgroups and Lagrangians
3:30 - V. Rodrigues, Equivariantization of abelian K-linear categories

October 28, 2014: Jeffrey Morton (Mt Allison), *Representing Higher Algebras: Categorification and Groupoidification Part I*

November 4, 2014: Jeffery Morton (Mt Allison), *Categorification of the Fock Monad: Categorification and Groupoidification Part II*

November 18, 2014: Bob Paré (Dalhousie), *Double categories and their morphisms*

November 25, 2014: Richard Wood (Dalhousie), *The waves of a total category*

December 2, 2014: Richard Wood (Dalhousie), *The waves of a totally cocomplete category II*

January 6, 2015:Bob Paré (Dalhousie), *Weak double categories and their morphisms*

January 13, 2015: Bob Paré (Dalhousie), *Weak double categories and their morphisms (continued)*

January 20, 2015: Bob Paré (Dalhousie), *The Double Category of Double Categories*

February 3, 2015: Bob Paré (Dalhousie), *Weak category objects*

February 10, 2015: Nasir Sohail (UCB), *Dominions, epimorphisms and amalgamation for ordered monoids*

February 24, 2015: Jeff Morton (Mt Allison), *Transformation Double Groupoids and Double Categories of Functors*

March 3, 2015:Jeff Egger (Halifax), *What is a doubly involutive monoidal category?*

March 10, 2015: Jeff Egger (Halifax), *What is a doubly involutive monoidal category? (Continued)*

March 24, 2015: Geoff Cruttwell (Mt Allison), *Structure theorems for finite semigroups, groups, and categories (part I)*

March 31, 2015: Geoff Cruttwell (Mt Allison), *Structure theorems for finite semigroups, groups, and categories (part II)*

April 7, 2015: Bob Raphael (Concordia), *On some reflective subcategories of the category of rings*

April 21, 2015: Richard Wood (Dalhousie), *The interpolation lemma for the waves of a totally distributive category*

GRAPH THEORY SEMINAR
Organizer: Elham Roshanbin

April 1, 2015: Urban Larsson (Dalhousie), *A Cellular Automaton for Blocking Queen Games*

January 24, 2015: Svenja Huntemann (Dalhousie), *Graphs and Flag Complexes are Game Complexes*

November 19, 2014: Dr. Margaret-Ellen Messinger (Mount Allison) *Recent work on the Eternal Domination problem*

May 26-28, 2014: Short Course offered by the Graphs-and-Games group
Speaker: Dr. Hal Kierstead

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:

September 17, 2014: Dr. Karl Dilcher: *Much ado about nothing: Zeros of polynomials*

September 31, 2014: Dr. Theodore Kolokolnikov: *Linear algebra and ODE's*

October 14, 2014: Dr. David Iron: *Title Kepler's Laws*

October 21, 2014: Dr. Robert Milson: *Orthogonal polynomials*

October 28, 2014 Dr. Jason Brown: *All You Need Is Math - The Connections Between Mathematics and Music*

November 5, 2014: Dr. Srinivasa Swaminathan: *Good Theorems Don't Die --- They Become Definitions.*

January 14, 2015: Dr. Sastri: *The Pigeonhole Principle and Some of its Applications.*

January 21, 2015: Dr. Keith Taylor: *A lot can be said about circles*

January 28, 2015: Dr. Karl Dilcher: *The Life and Times of Leonhard Euler*

February 4, 2015: Dr. Dorette Pronk: *The Moduli Space of Similar Triangles: What is Half a Point?*

February 25, 2015 Dr. Genevieve Goulet: *Why would you want to teach kids mathematics*

Student talks:

September 22, 2014: Hayley Tomkins: *A numerical approach to predator-swarm dynamics*

November 26, 2014: Elle Andersen-Aitken: *Hausdorff Dimension of Self-Similar Sets*

December 3, 2014: Jorge Goldschmied Chale: *A quick introduction to categories and elementary toposes.*

February 11, 2015: Josh Gummett: *LenRes game.*

March 4, 2015: Scott Cameron: *Seepage on Grids*

March 11, 2015: Islay Wright: *Determining the best linear embedding for large real-life networks*

March 18, 2015: Ben Potter

March 25, 2015: Dean Hatt: *Problems in the Pagerank*

March 30, 2015: Mohammad Kidwai: *Zeros and Irreducibility of Stern Polynomials*

April 1, 2015: Justine Gauthier: *Extensions of the Hyperbinary Representations in Stern's Sequence*

April 8, 2015: Shoulong Li: *The Black-Scholes Revisited*

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.

Jason Brown:
Creativity in Mathematics, The Creative Process, Dalhousie University, February 24, 2015.

A Hard Day's Math: The Connections Between Mathematics and Music, invited speaker, Michigan State University, November 18, 2014.

A Hard Day's Math: The Connections Between Mathematics and Music, invited speaker, Ideacity 2014, Toronto, June 20, 2014.

The g-Convexity of Graphs, CMS Summer Meeting 2014, Winnipeg, June 8, 2014.

Marie-Andree B Langlois:
Elliptic Curves with Complex Multiplication and a Relation to their Quadratic Twist, AMS Fall Meeting, Halifax, NS, October, 2014.

Karl Dilcher:
Pairs of reciprocal quadratic congruences involving primes, CMS Summer Meeting, Winnipeg, June 2014.

The polynomials of Mahler and roots of unity, Canad. Number Theory Assoc. Conference, Carleton University, June 16, 2014.

Pairs of reciprocal quadratic congruences involving primes, Fibonacci Conference, Rochester, NY, July, 2014.

Zeros and irreducibility of Chebyshev-like polynomials, Fibonacci Conference, Rochester, NY, July, 2014.

Irreducibility and factorization results for some classes of polynomials, Elementary and Analytic Number Theory Conference, Hildesheim, Germany, August 1, 2014.

Zeros and irreducibility of Chebyshev-like polynomials, AMS Sectional Conference, Dalhousie, Oct. 18, 2014.

The multiplicative orders of certain Gauss factorials, AMS Sectional Conference, Dalhousie, Oct. 19, 2014.

Pairs of reciprocal quadratic congruences involving primes, Number Theory Day, Dalhousie, Oct. 20, 2014.

Generalized Stern polynomials, hyperbinary expansions, and continued fractions, Joint Mathematics Meetings, San Antonio, TX, Jan. 12, 2015.

The multiplicative orders of certain Gauss factorials (Seminar talk), University of Illinois, Urbana, IL, Feb. 19, 2015.

Higher-order convolutions for Bernoulli and Euler polynomials, International Conference in

Honour of M. Ismail, Orlando, FL, May 11, 2015.

Aysel Erey:
Sigma-polynomials and their roots, SIAM Conference on Discrete Mathematics, Minneapolis, June 16, 2014.

Graph Polynomials, BIRS Workshop: CWMAC, Banff, October 4, 2014.

Nursel Erey:
Betti numbers of simplicial forests, Connecting Women in Mathematics Across Canada, Banff, October 4, 2014.

Betti numbers of simplicial forests, AMS Fall Eastern Sectional Meeting, Special Session on Commutative Algebra and Its Interactions with Algebraic Geometry, Halifax, October 18, 2014.

Multigraded Betti numbers of monomial ideals, CMS Winter Meeting, Commutative Algebra: Interactions with Algebraic Combinatorics, Algebraic Geometry, and Representation Theory, Hamilton, ON, December 8, 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.

Hong Gu:
Non-negative matrix factorization for analysis of metagenomics data, 2nd ISNPS (International Society of Non-Parametric Statistics) conference, Cadiz, Spain, June 2014.

Svenja Huntemann:
Characterizing Game Complexes, at the Combinatorial Game Theory Colloquium I, Lisbon, Portugal, January, 2015.

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:
Infinite geometric graphs and properties of metrics, annual program seminar, Institute for Mathematics and Applications, Minneapolis, Minnesota, September 25, 2014.

Spatial Preferential Attachment as a principle for link formation in networks, invited talk, workshop on Computational and Statistical Challenges in Networks and Cybersecurity, CRM, Montreal, May 4-8, 2015

Nancy Khalil:
Analysis of the Gierer-Meinhardt System with Fixed Delay, CAIMS conference, Saskatoon, SK, June, 2014.

Joanna Mills Flemming:
'The Ocean Tracking Network: from Data to Knowledge', University of British Columbia Peter Wall International Research Roundtable: Building a Bioanalytical Theory for Analysis of Marine Mammal Movements, May 5, 2015.

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.

Joseph Mingrone
Smoothed Bootstrap Aggregation for Detecting Positive Selection at Amino Acid Sites, Centre for Comparative Genomics and Evolutionary Bioinformatics, Dalhousie University, December 11, 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:
Orbifolds as Manifolds, Foundational Methods in Computer Science 2014, University of Calgary, June 6, 2014.

*Noneffective Orbifolds***,** Departmental Seminar, University of Calgary, Jun 11, 2014.

Atlases for Nonreduced Orbifolds, YaMCATS, University of Leicester, December 18, 2014

Mapping Spaces for Orbispaces, Infinite Dimensional Structures in Higher Geometry and Representation Theory Center for Mathematical Physics, Universität Hamburg, Hamburg, February 20, 2015.

Neil Ross:
Optimal Ancilla-free Clifford+T Approximation of z-Rotations, Plenary lecture, 18th Conference on Quantum Information Processing (QIP 2015), Sydney, Australia, January, 2015.

Peter Selinger:
Types for quantum computing, Invited lecture, 21st International Conference on Types for Proofs and Programs (TYPES 2015), Tallinn, Estonia, May 18–21, 2015.

Number-theoretic methods in quantum computing, Invited lecture, Amsterdam Quantum Logic Workshop, Amsterdam, May 7–8, 2015.

Efficient synthesis of quantum circuits by number-theoretic methods, Invited lecture, Conference on Knot Theory and its Applications to Physics and Quantum Computing, Dallas, Texas, Jan 6–9, 2015.

Optimal ancilla-free Clifford+T approximation of z-rotations, Conference in honour of Prakash Panangaden on the occasion of his sixtieth birthday, Oxford, May 23–25, 2014.

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

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.

Edward Susko
Tests for Two Trees using Likelihood Methods, Joint Statistical Meetings, Boston, Massachusetts, August 2014.

BRAIN TEASERS

Edited by
Dr. S. Swaminathan

1. What is the rule that governs the following arrangements of digits?

8 5 4 9 1 7 6 3 2 0

5 2 8 9 4 7 6 2 1 0

2. Consider the following sequence:

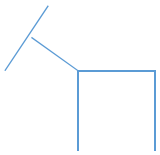
11, 34, 17, 52, 26, 13, 40, 20, …

What is the rule that determines each term from its predecessor?
Continue this sequence further and see what happens.

3. A regular hexagon and an equilateral triangle have the same perimeter. What is the ratio of their area?

4. Find all whole numbers for which the number and its square together consist of exactly nine digits with each of the digits 1, 2, 3, … 8, 9 appearing exactly once. (0 does not appear.)

5. By moving one match in the configuration below, produce a new figure similar to the original. (The final figure need not be oriented the same way.)



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

CHASE REPORT

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Editor: Queena Crooker-Smith, Administrator
queena@mathstat.dal.ca
Phone: (902) 494-6911
Fax: (902) 494-5130

We welcome your suggestions and comments for future issues.

Department of Mathematics and Statistics
Bruce Smith, Chair
Hong Gu, Statistics Director
Karl Dilcher, Mathematics Director (acting)
Sara Faridi, Mathematics Graduate Coordinator
David Hamilton, Statistics Graduate Coordinator