



# Newsletter

Autumn 2013

## John Grant McLoughlin wins Adrien Pouliot Award

The Canadian Mathematical Society (CMS) has announced that Professor John Grant McLoughlin of the University of New Brunswick is the recipient of the 2013 Adrien Pouliot Award in recognition of his outstanding contributions to mathematics education in Canada. The award will be presented at the 2013 CMS Winter Meeting in Ottawa.



John Grant McLoughlin is a Professor in the Faculty of Education at UNB (Fredericton) and also holds a cross appointment with the Department of Mathematics and Statistics in the Faculty of Science. He obtained his PhD in Mathematics Education in 1997 at the State University of New York, Buffalo. He has held appointments in Mathematics at Sir Wilfred Grenfell College (MUN) and in Mathematics Education at Okanagan University College and Memorial University of Newfoundland. His years of dedicated teaching at the university have earned him a reputation as an innovative caring teacher who works closely with his students, those with strong mathematical ability as well as those who wish to forge new paths with the subject. Based on this body of work, he received the 2008 Allan P Stuart Memorial Award for Excellence in Teaching at the University of New Brunswick and in 2011 was named a University Teaching Scholar.

Since 2010, John has been education co-editor of the CMS Notes, along with Jennifer Hyndman of the University of Northern BC. He brings a wealth of experience to this position, decades of working with students and teachers in British Columbia, Nova Scotia, Newfoundland and Labrador, Ontario and, of course, New Brunswick. His recent activities have included ongoing collaboration (with Ryan Jones) as mathematical guest teachers in Wendy Sinclair's Grade 4 classroom in Fredericton, visits to numerous schools, recreational math exhibits in public settings, organization of The Beauty of Mathematics public library lecture series, and participation in local initiatives including math camps, Math

Circles, and efforts to address numeracy skills of nursing students. AARMS is proud to be a sponsor of these recent outreach activities. He continues to be engaged with mathematical contests from Newfoundland and Labrador to British Columbia, and the creation of "hands-on" mathematical activities and problems at all levels.

John's publications and activities reflect his interests in problem solving and outreach. He served seven years on the Editorial Board of *Crux* with Mayhem, has co-authored (with Bruce Shawyer and Peter Booth) several problems books including three volumes of *Problems for Mathematics Leagues* in the CMS's ATOM (A Taste of Mathematics) Series. Recently he has co-edited Jim Totten's *Problems of the Week*. John assisted Rick Brewster, Fae DeBeck and others at Thompson Rivers University in Kamloops with the organization of *Sharing Mathematics: A tribute to Jim Totten*. This 2009 initiative subsequently led to *Sharing Mathematics* becoming an annual event in the BC math community.

The Adrien Pouliot Award was inaugurated in 1995 to recognize individuals who have made significant and sustained contributions to mathematics education in Canada. The award is named for Adrien Pouliot, the second CMS President, who taught mathematics at Université Laval for 50 years and was instrumental in developing Laval's engineering and science faculty.

## Call for Applicants to our Annual Postdoc Competition

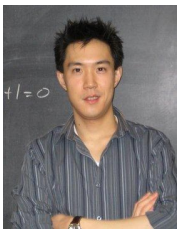
Our annual postdoctoral fellowship competition is now open. AARMS postdoctoral fellowships are awarded, on the recommendation of our Scientific Review Panel (SRP), to beginning researchers who received their PhD no more than four years before applying. Applications will be considered from those who anticipate receiving their PhD before the proposed start time of the fellowship, however the PhD must be in hand before actually beginning the fellowship. AARMS will provide \$17,500 per year for the fellowship and the supervisor is responsible for organizing matching funds of at least this amount. Please visit our webpage for the rules of the competition and instructions on how to apply. Application deadline is December 13. [www.aarms.math.ca/pdf](http://www.aarms.math.ca/pdf)

# News

## Jacques Guigné awarded Rayleigh Medal

The chair of the AARMS Board, Jacques Guigné was awarded the prestigious Rayleigh Medal at a recent international conference in Corfu. The medal was presented by the president of the Institute of Acoustics; it is awarded without regard to age to persons of undoubted renown for outstanding contributions to acoustics. It is normally presented to a UK acoustician in even-numbered years and an overseas acoustician in odd-numbered years. Congratulations Jacques!

## An AARMS Postdoc Reports



My name is Justin Tzou. I am an AARMS postdoctoral fellow at Dalhousie University in the Mathematics and Statistics Department. My supervisor is Theodore Kolokolnikov. I obtained my undergraduate degree in Engineering Physics at the University of British Columbia in Vancouver, BC, and my PhD in Applied Mathematics at

Northwestern University in Evanston, Illinois. My advisers at Northwestern were Bernard Matkowsky (main), Alvin Bayliss, and Vladimir Volpert. This past August, I completed a postdoctoral appointment in the Department of Mathematics at the Technion -- Israel Institute of Technology in Haifa, Israel.

My main area of research focuses on analyzing diffusion-driven spatial pattern formation in different regimes of reaction-diffusion systems. While diffusion is generally thought of as a process that smooths out spatial inhomogeneities, it can be responsible for the formation and stabilization of complex patterns when two or more interacting species are present. In general, nonlinearities in reaction-diffusion systems make analysis rather difficult, though many interesting results have been obtained by solving systems numerically. In certain special regimes, however, much progress can be made by way of analysis, yielding deeper insights than can be otherwise gained from purely numerical results.

My two most recent works have been in two such regimes. In the singularly perturbed regime, where the diffusivity of one species is asymptotically smaller than that of the other, steady-state spike-type solutions may be constructed and analyzed using the technique of matched asymptotic analysis. In such solutions, the mass of one species is heavily concentrated near a finite number of points on the one-dimensional line. For the Brusselator reaction-diffusion system, we analyzed such solutions to derive explicit stability thresholds, which, when exceeded, lead to either collapse of one or more spikes, synchronous or asynchronous oscillations in spike amplitude, or a slow drift of spikes away from their equilibrium locations. Numerical solutions were also obtained to corroborate the analysis.

In the weakly nonlinear regime of the same Brusselator system, we found a (codimension-one) region in parameter

space where a supercritical Turing mode (stationary periodic spatial patterns) and supercritical Hopf mode (spatially homogeneous temporal oscillations) were simultaneously stable. In a codimension-zero region of parameter space containing the region of bistability, we computed an infinite number of solutions characterized by the coexistence of a stationary Turing mode and an oscillatory Hopf mode. The solutions differed in the number of wavelengths of the periodic state, and, more strikingly, were organized on snaking branches characterized by a series of saddle-node bifurcations. Such solutions stem from an extension of the theory of homoclinic snaking, where the time-oscillatory state is replaced by a stationary flat state. While similar in many regards, the possibilities for analysis of the time-oscillatory solutions were limited because one must then account for both the time and spatial dimensions of the partial differential equations.

## A Student Reports on the AARMS Summer School 2013

The Atlantic Association for Research in the Mathematical Sciences (AARMS) Summer School took place at Memorial University of Newfoundland (MUN) in historic and scenic St. John's, Newfoundland, Canada between July 15 and August 9, 2013. Dr. Xiaoqiang Zhao from the Department of Mathematics and Statistics at MUN organized the program, which gave participants from around the world the opportunity to study under several respected mathematical biologists.

During these four weeks, 44 students and two postdoctoral fellows were able to participate in four different classes, each of which exposed them to a variety of advanced mathematical techniques. Two of the more technical subjects were Stochastic Modeling with Applications in Biology, co-taught by Drs. Linda and Edward Allen, and Reaction-Diffusion Equations and Applications, taught by Dr. Steve Cantrell. In one of the most popular courses, Mathematical Modeling in Developmental Biology and Medicine, Dr. Philip Maini integrated the introduction of bifurcation analysis and Michaelis-Menten kinetics with a discussion on substrate activity and cellular dynamics. Similarly, in Mathematical Methods to Gain Biological Insights, Dr. Odo Diekmann used discussions on enzyme kinetics, population modeling, and diffusion models as catalysts for his mathematically based lectures.

In addition to the courses, what made the summer school unique was the atmosphere. The courses pushed students to extend the concepts via-out-of class projects, which encouraged a collaborative environment. Students were able to seek each other out in order to discuss possible ideas and perspectives and, due to the vast array of backgrounds present, they were able to see that working with biologists, ecologists, and other biomathematicians can lead to a better understanding of the topics at hand. Ultimately, this experience gave the students a taste of what it is truly like to work in the collaborative field that is mathematical biology.

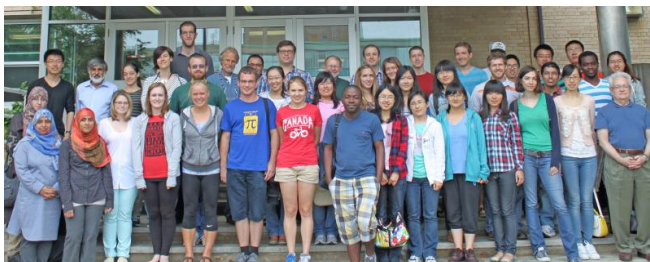
Even though the coursework was their first priority, students made sure to take advantage of their free time and all that St John's had to offer. Summertime was in full swing in July, which allowed for a lot of outdoor activities. During the first weekend, some students went on a whale watching boat tour. The following day, a few brave souls hiked 15 miles along the East Coast Trail in order to visit Cape Spear, the most easterly point in North America. The hike was by far a highlight of the trip, allowing classmates to bond and enjoy breath-taking views of the Atlantic Ocean and Newfoundland coastline.

While participating in the summer school, students also had the opportunity to attend the 2013 AARMS Mathematical Biology Workshop that took place at MUN from July 27- 29, 2013. The workshop was organized by Drs. Amy Hurford and Xiaoqiang Zhao and featured several parallel sessions and seven plenary lectures. Including the summer school students, there were 84 attendees from Europe, Canada, the United States, and Asia.

The first day of the conference focused on the discussion of ecology and epidemiology. The second day of the conference was geared towards cellular processes, pattern formation, and population dynamics and the discussion of these topics was enhanced by the plenary lectures given. Following the lectures of the second day, attendees were treated to a public lecture by Dr. Simon Levin, as well as a banquet at the Suncor Energy Fluvarium. The third and final day of the conference focused on population dispersal and evolution. A series of parallel presentations were followed by the final plenary lecture: Dr. Steve Cantrell concluded the conference with his discussion of "Nonlinear Diffusion and Resource Matching in Population Dynamics".

Being a part of the AARMS Summer School and Workshop was a once in a lifetime experience and we would like to thank all those that made it possible. In addition to AARMS, the National Science Foundation provided funding for the US participants to travel to the AARMS Summer School, as well as for US scientists to attend the AARMS Workshop. Additional support was provided by The Conference Fund, the Dean of Science, and the Mathematics and Statistics Department at Memorial University, and by the Centre de Recherches Mathématiques who provided travel support for Dr. Simon Levin. Finally, thank you to Drs. Zhao and Hurford for organizing such amazing events. Further information about the meetings can be found here: <http://www.aarms.math.ca/summer/2013/index.html> <http://www.math.mun.ca/~ahurford/aarms/>.

- Kelsey Gasior, PhD student, North Carolina



*participants at the 2013 Summer School*

## Donald Violette Recognized with QE II Diamond Jubilee Medal



In February 2013, Dr. Donald Violette, of the Université de Moncton, received the Queen Elizabeth II Diamond Jubilee Medal for his contributions to the promotion of mathematics in New Brunswick and Canada. Dr. Violette received his Ph.D. from l'Université de Sherbrooke in 1984 and was the first francophone from New Brunswick to earn a doctorate in mathematics. His desire to

encourage excellence in mathematics among young francophones led him to present over 400 talks in French high schools, attended by over 13,500 students. Among his many contributions, Dr. Violette created Concours de mathématiques Poincaré, a competition for french high school students, as well as Camps mathématiques de l'Acadie, a camp for the top participants of the competition. He also created Concours de mathématiques Möbius, a competition for grade 5 french students, and Séjour Vacances "À la découverte des mathématiques", a camp for the participants. Also active in research, Dr. Violette is internationally published and has been invited to speak in over 50 conferences around the world.

## Collaborative Research Group: Games and Graphs

Although there have been many active researchers in Atlantic Canada working collaboratively on topics in both game theory and graph theory, a formal research group was recently created and funding from AARMS began in September 2013. The goal of the research group is to promote research in graph theory and combinatorial game theory at all levels and a core interest is the interaction of graphs and disciplines outside of graph theory, and the structures that arise. A major emphasis is on interactions that have a dynamical aspect.

We recently held our first event as a collaborative research group: the AARMS session that followed the recent Science Atlantic conference at UPEI. The session featured keynote speakers Dr. Ortrud Oellermann (Winnipeg) on "Reconstructing a Graph from its Digitally Convex Set" and Dr. Andrew Beveridge (Macalester, USA) on "Maker-Breaker Games on Random Geometric Graphs". The event was open to everyone and was well attended by both faculty and students from Atlantic Canada. In the morning, a session was held in which participants presented interesting open problems and then broke into groups to work on these problems with the idea that collaboration would continue in the future. Future events include several workshops and a student electronic conference and more information on the activities of the Games and Graphs group can be found at: [http://mathstat.dal.ca/~rjn/Graphs\\_and\\_Games/Graphs\\_and\\_Games/Welcome.html](http://mathstat.dal.ca/~rjn/Graphs_and_Games/Graphs_and_Games/Welcome.html)

## Science Atlantic Conference a busy time at UPEI

The annual Science Atlantic Mathematics, Statistics and Computer Science conference was held at the University of Prince Edward Island from October 18 to October 20, 2013. This is the 36th year the conference has been held (under various names: originally it was Atlantic Math Days, and for many years it was the APICS Math, Stats and CS meeting).

Over 180 people attended the conference, including over 100 undergraduate students. As usual the first major events were the Mathematics Problem Solving Competition and the Computer Science Programming Competition on Friday afternoon. On Friday evening the Blundon Lecture was presented by Anthony Bonato of Ryerson University. Anthony spoke on "Six dimensions of separation in social networks". This was followed by a welcoming reception.

Saturday was the main day for the conference. The morning and early afternoon was mostly occupied by undergraduate student research talks. Just before lunch, Lila Kari of Western University presented the Sedgwick Lecture on "Are you smarter than a cucumber? or How to measure and visualize species' relatedness". On Saturday afternoon, there were a number of contributed talks by both faculty and graduate students, and midafternoon Mark Glickman of Boston University presented the Field Lecture on "Rating the Chess Rating System". The day's program finished with a session on Education and Publishing, where representatives from Nelson Education and Pearson Education discussed the changing landscape in Education Publishing and how it related to Mathematics, Statistics and Computer Science instruction.

On Saturday evening, the conference banquet was held at a nearby hotel. As part of the program at the banquet, prizes were awarded for the top three teams in the Math competition and the Computer Science competition, and prizes were awarded to the top three undergraduate student talks in Mathematics and Statistics and the top three undergraduate student talks in Computer Science:

### Math Competition Awards:

First place: Dylan Day and Patrick Murray (Acadia); Second place: Mathieu Girard and Yuhuai Wu (UNB); Third place: Christopher Pardy and Adam Gardner (MUN).

### CS Competition Awards:

First place: David Ackerson, Conor McCullough and Taeler Dixon (UNB); Second place: Andy Couturier, Antoine Handfield and David Ouellette (Moncton); Third place: Lourens Schep, Daniel Deveau and Samuel Coleman (Acadia).

### Math and Stats undergraduate research talk awards:

First place: Matthew van Bommel (Acadia) for his talk on "Stage-wise surrogate modelling of Tidal Power Functions"; Second place: Zack Delaney (MTA) for his talk on "Eternal Domination on  $3 \times N$  grids"; Third place: Peter Graves-Ackerley (SMU) for his talk on "Traces of Unitary matrices with disjoint spectra and Spect's Theorem".

### CS Undergraduate Research Talk Awards:

First place: William Herring (UPEI) for his talk on "Automata compression algorithms"; Second place: Mariah Martin Shein (MTA) for her talk on "Classifier strategy and class imbalance in real world data"; Third place: Sarah van der Laan (MTA) for her talk on "Implementing views for a Database Design Tool"

The judges of the talks conveyed how difficult it was to make the decisions on prize winners as there were 24 undergraduate student talks in total, and all were of extremely high quality.

The last order of business at the banquet was recognition of Edgar Goodaire (MUN), who received an Outstanding Member Award from Science Atlantic for his many years of valuable service to the organization.

On Sunday, the conference continued with an AARMS session on Graph Theory. The session included invited lectures by Andrew Beveridge (Macalester College) and Ortrud Oellermann (University of Winnipeg) and a number of problem solving sessions.

I received many compliments and much positive feedback from conference participants. In particular, the three plenary talks (by Anthony, Lila and Mark) were singled out for praise for both the interesting subject matter and excellent presentation.

I would like to thank our main sponsors: Science Atlantic, AARMS (Atlantic Association for Research in the Mathematical Sciences) and the University of Prince Edward Island, and our other sponsors, including Bell Aliant, the Canadian Mathematical Society (and its Undergraduate Committee), Maplesoft, Nelson Education and Pearson Education. Thanks also to my organizing committee: Shannon Fitzpatrick, Nasser Saad, Chris Vessey, Cezar Campeanu, and David Hanna.

A number of initiatives and ideas were discussed at the business meetings of the Science Atlantic committees (for Math & Stats and for CS) and some changes are coming to the conference which we hope will make the conference even more enjoyable.

If you are faculty or student in Mathematics, Statistics or Computer Science and haven't attended this conference, you should give it a try. I'm sure you will not regret it. I always leave feeling energized and optimistic about the state of mathematics in Atlantic Canada. Perhaps I was a little less energized that usual this year as I had to organize the event which took a bit away from my enjoyment. I am looking forward to next year's meeting in October 2014 at the University of New Brunswick Saint John when I can once again just be an attendee. Hopefully, I will see you there.

*- Gordon MacDonald, UPEI  
Science Atlantic Math & Stats Committee Chair  
and Conference Organizer*

## Call for Proposals

We encourage mathematicians in Atlantic Canada to submit proposals for funding for workshops, conferences, outreach projects, etc to our Online System. The next deadline for submission: January 15, 2014. For more details please visit [www.aarms.math.ca/events](http://www.aarms.math.ca/events)

# Recent and Upcoming Events

## Science Atlantic Mathematics, Statistics and Computer Science Conference

Organizers: Shannon Fitzpatrick, Gordon MacDonald, Chris Vessey, Nasser Saad, Cezar Campeanu  
Location: University of Prince Edward Island  
Date: October 18-20, 2013  
Contact Information: Gordon MacDonald

## Games and Graphs AARMS Session of the Science Atlantic Mathematics & Statistics Conference

Organizers: Stephen Finbow, Shannon Fitzpatrick  
Location: University of Prince Edward Island  
Date: October 20, 2013  
Contact Information: Stephen Finbow

## Sustainability of Aquatic Systems Networks

Organizers: Frithjof Lutscher, James Watmough  
Location: University of New Brunswick, Fredericton  
Date: October 22-25, 2013  
Contact Information: Frithjof Lutscher

## Combinatorial Algebra meets Algebraic Combinatorics

Organizers: Sara Faridi, Hugh Thomas, Mike Zabrocki  
Location: Dalhousie University  
Date: January 24-26, 2014  
Contact Information: Hugh Thomas

## Two weeks at WATERLOO - A Summer School for Women in Math

Organizers: B. Csima, S. A. Campbell, K. Hare, M. Frigon, I. Laba, M. Lalin, L. Pramanik, G. Wolkowicz  
Location: University of Waterloo  
Date: August 10-23, 2014  
Contact Information: Barbara Csima

## Recent developments in the adaptive solution of PDEs

Organizers: Ronald Haynes, Paul Muir, Hermann Brunner  
Location: Memorial University, St. John's  
Date: August 17-22, 2014  
Contact Information: Ronald Haynes

## The Coast to Coast Seminar Series

Lectures on topics from Mathematics and Computer Science  
Location: In the Videoconferencing facility of your university  
Date: Every Second Tuesday at 3:30pm (AST) during term time  
More details: visit the Coast to Coast Seminar Page

AARMS is proud to sponsor high-quality activities in Atlantic Canada which significantly enhance research and the training of graduate students.

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*Neglect of mathematics works injury to all knowledge, since he who is ignorant of it cannot know the other sciences or the things of the world.*

*~Roger Bacon*