Atlantic Association for Research in the Mathematical Sciences

Research - Outreach - Community

Newsletter

Autumn 2012

From the AARMS Director

Among the new voices at the last AARMS Board Meeting were two industry leaders. Mike Ashar, CEO of Irving Oil and Jacques Guigné, CEO of AcousticZoom, both enthusiastically agreed, last Spring, to serve on the Board of AARMS. Each brought fresh ideas and a different perspective; I am very pleased to have these energetic and engaged representatives of industry on our Board.

Mike Ashar was recruited to AARMS by former director Viqar Husain. Last Fall, Viqar was asked by Mr. Ashar to lead a discussion on mathematics and its application to theoretical physics at a monthly "knowledge session" he runs at Irving oil. Viqar was impressed by the turnout and the questions. This initiative of Mr. Ashar is an expression of his dedication to education in its broadest interpretation. A recent Globe and Mail profile of Mr. Ashar names lifelong learning as a "cherished tenet" of Mr. Ashar.

Dr. Jacques Guigné is a scientist specializing in geophysics and underwater acoustics. He leads a new company which develops innovative technology for 3D seismic imaging of the sea floor using steered beams of acoustic energy. He told us during the meeting that he is used to working alongside mathematicians. In an eloquent letter to the provincial government of Newfoundland and Labrador, written in support of an AARMS request for funding, Dr. Guigné writes: "An awareness and mastering of mathematical comprehensions and literacy are well recognized in advanced technological based economies, as essential building blocks for delivering on global intellectual capital".

I am especially happy with the support of Mike Ashar and Jacques Guigné because they come from outside academia. In these days of budget cuts and restrictions on research funding, it is easy to fall into the belief that our research accomplishments are not appreciated outside our own circles. It is heartening to see the contrary. A recent incident illustrates the point.

Recently, I heard from a former student with a background in computer science and statistics. His thesis, on Bayesian models for data mining, contained a wealth of mathematical ideas, and was a joy to read. After two academic post-doctoral positions, he was preparing to leave for the US to join a high-tech company in a senior R&D position.

Over lunch, he told the story of how he got the job. In fact, he credited the persistent efforts of a recruiter for the company, who sought him out, and pursued him until he was ready to go for an interview. The company's work did not seem all that compatible with my friend's expertise, but he was encouraged by a line in the job description which asked for someone who could learn quickly and was not afraid to try new projects.

Clearly, the academic career and mathematical background of my friend was seen as a great asset by the recruiter and the company. They must know from experience that any successful PhD student will possess the qualities mentioned in the job description. In industry, mathematical ability is seen as a great asset.

Mathematicians tend to be unassuming. We love our work, but often neglect to emphasize its importance. We should be proud of our role in the advancement of Canada's scientific patrimony and the education of highly valued participants in the knowledge economy. Industry leaders recognize the intrinsic value of mathematical research; let's convince bureaucrats and politicians of the same, and let's acknowledge our own worth.

- Jeannette Janssen

CMS Summer Meeting - submit your session proposals

The Canadian Mathematical Society will hold its 2013 summer meeting in Halifax on June 4-7. As scientific co-directors we would like to invite members of the AARMS community to submit session proposals for the upcoming meeting. The proposal should include:

- a title,
- names of the session organizers,
- a brief writeup of scope of session,
- a preliminary list of invitees to the session.

The session proposals will then be submitted to the CMS Research committee for approval. We look forward to your proposals and to working with AARMS in the preparations for amemorable and productive summer meeting.

- Rob Milson, Dalhousie, email: rmilson@dal.ca
- Robert Dawson, Saint Mary's, email: rdawson@cs.stmarys.ca

News

An AARMS Postdoc Reports

My main research interest is the representation theory of associative algebras. Roughly speaking, the general goal when working in this area of research is to get a better understanding of an algebra by studying its representations, that is, the modules over that algebra. In other words, we try to understand the structure of the module category of a given algebra.To achieve this, we can use tools coming from a broad variety of areas: algebra, algebraic geometry, combinatorics, category theory, and others.

From the algebraic point of view, the Auslander-Reiten theory provides a powerful set of tools to understand the modules of a given algebra and the morphisms between these modules. The data encoded in the Auslander-Reiten theory of an algebra provide us with a combinatorial object called the Auslander-Reiten quiver (a quiver is just an oriented graph) of that algebra. Some of my recent research works were mainly devoted to the study of the Auslander-Reiten theory and Auslander-Reiten quivers in different settings (but still related to representations of algebras). One of them is the category of representations of an infinite (but strongly locally finite) quiver. Infinite quivers are becoming more and more prominent in representation theory of algebras.

The representation theory of an algebra can also be studied by geometric means. This is what we did in a recent joint project with Colin Ingalls and Hugh Thomas at UNB. An important class of algebras is the class of finite dimensional hereditary algebras, each of which can be described by a quiver. Depending on the shape of the quiver, the representation theory of such an algebra can be 1) easy, 2) harder but controllable and 3) very difficult with very few hopes. The quivers arising in part 2) are the quivers of Euclidean type (also called extended Dynkin type). In this project, we tried to understand the representation theory of algebras given by quivers of Euclidean type by means of the semi-invariants of quivers. These semiinvariants, which are important objects coming from geometric invariant theory, allow us to find nice subcategories of the module category, called semi-stable subcategories. We studied these subcategories and their intersections from different point of views. We provided a geometric construction using simplicial complexes and we gave an explicit way to construct these geometric objects.

As an AARMS and NSERC postdoctoral fellow at UNB, I continue the study of representation theory of algebras. At the moment, my work is taking the direction of cluster algebras, a new theory that emerged a decade ago from the work of Fomin and Zelevinsky on dual canonical bases and total positivity in semisimple Lie groups. The theory of cluster algebras is now a very popular theory which is closely related to the representation theory of algebras, and which reveals many new links between representations of algebras and other mathematical topics.

I shall end by saying that I am very grateful to AARMS and NSERC for giving me the opportunity to spend more time on my research projects.

- Charles Paquette

24th Canadian Conference on Computational Geometry

Each August, the Canadian Conference on Computational Geometry (CCCG) brings together geometers from around the world. This year Prince Edward Island hosted the event for the first time, which means that the conference has now reached every province. The venue was at the Culinary Institute building of Holland College, a peaceful location on the waterfront of Charlottetown. Between August 8-10, over 80 participants gathered to follow two parallel sessions of talks, 50 altogether, held in a modern theatre auditorium and a secondary room overlooking the water. Attendees also enjoyed three plenary lectures by Pankaj Agarwal, Joseph Mitchell and Gunter Ziegler, and an Open Problems session where participants shared their favorite unsolved questions with everyone. More than half of the registrants were students and postdocs, supported generously by AARMS, PIMS, Mprime and Fields.

The organizers arranged for plenty of networking time after hours as well, which was appreciated by most of the group, in particular those traveling on their own. A reception was held on the 7th at the St.James Gate pub. The casual atmosphere and high attendance throughout the entire evening were a great start to the conference. On the second night a dinner took place at the quaint Lobster-on-the-Wharf, a traditional restaurant with fresh local seafood, set on the harbor. The third evening featured another local restaurant/pub, the suitably named Old Triangle. The schedule also included two late afternoon trips to the P.E.I. National Park area just outside town. Weather was cooperative, so many of the participants enjoyed a swim in the shallow waters of the island's famous sandy beaches, or continued proving theorems on the sand - as veritable descendants of Pythagoras.

- Greg Aloupis

AARMS Summer School

The twelfth annual AARMS Summer School will be held at Memorial University from July 15 to August 9, 2013. The summer school is intended for graduate students and promising undergraduate students from all parts of the world. More information will be posted on our website:
www.aarms.math.ca/summer

Games-At-Dal 7: Combinatorial Games Workshop

The workshop (June 24-27) attracted researchers from North America, Australia, Sweden, France, Portugal and Israel, including 4 four graduate students. All of us would like to thank AARMS for its support. The format of the Workshop is to work on problems for most of the time with only one day of talks. The topics were:

LIM - played with three heaps; take away N from two and add N to the third. This was successfully solved by a subgroup; advances were made on the games of:

Partizan **BERNOULLI**: This is played with two lists of positive integers of length n, say L_i and R_i, $i = 1, \ldots, n$.

Left can trim the lists to L_i and R_i, $i = 1, \ldots, m$,
if $L_{m+1} \leq R_{m+1}$ for all i;

Right can trim the lists to L_i and R_i, $i = 1, \ldots, m$,
if $R_{m+1} \leq L_{m+1}$ for all i.

Progress was made on particular restricted lists of numbers but the general case remains unsolved.

TAKE-AWAY games on Ferrer's Diagram. **WELTER'S** game is a such a game with a fascinating, non-obvious solution. Other variants were discussed and progress on some (easy?) variants was made.

Talks and Participants: Alex Fink (USA): Lattice games and computation. Bao Ho (Australia): Translation phenomenon of P-positions in variants of Wythoff's game. Urban Larsson (Sweden): (1,2)GDWN splits. Neil McKay (Can): Ordinal Sums. Rebecca Milley (Can): Endclosed games. Gabriel Renault (France): Toppling Switches. Carlos Santos(Portugal): On Finite and Infinite Lattices of Games. Eric Duchene (France). Mike Fisher (USA). Aviezri Fraenkel (Israel). Richard Nowakowski (Can). Elham Roshambin (Can). Angela Siegel (USA). David Wolfe (Can).

- Richard Nowakowski

Eric Duchene, Alex Fink and Urban Larsson successfully solved the navigation game at the Workshop Barbecue

ISS 2012

The International Symposium in Statistics (ISS) on Longitudinal Data Analysis Subject to Measurement Error, Missing Values, and/or Outliers took place at Memorial University from July 16 to 18, 2012. This meeting, covering three specialized research areas for longitudinal data analysis, was attended by 51 delegates from many countries such as Brazil, Switzerland, Spain, Netherlands, Mauritius, USA and Canada, covering almost the entire globe. The meeting was a grand success with an excellent academic program complemented by various social events including a barbeque, the symposium banquet and a local scenic bus tour.

The symposium atmosphere was full of love. The symposium welcome address was given by Dr. Ray Gosine, Associate Vice President Research of Memorial University, followed by a plenary talk given by Professor Brajendra Sutradhar on successes and further challenges in the area of longitudinal data analysis when data are subject to measurement error. Other plenary and special invited talks in this area were delivered by Professors Leonard Stefanski from North Carolina State University, T. J. Wansbeek from University of Groningen, Netherlands, and John Buonaccorsi from University of Massachusetts. The second day of the symposium was devoted to the analysis of longitudinal data subject to non-response. The plenary and special invited talks on this theme were delivered by Professors Brajendra Sutradhar from Memorial University, Paul S. Albert from NICHD, Maryland, USA, Richard J. Cook from University of Waterloo, and Michael Daniels from University of Florida. The symposium on its third day dealt with successes and challenges for analysis of longitudinal data possibly contaminated by outliers. The three main talks of the day were delivered by Professors Brajendra Sutradhar from Memorial University, Julio M. Singer from Brazil, and Elvezio Ronchetti from University of Geneva.

The symposium had another five invited speakers covering these three areas. Also, contributed papers were presented by ten speakers including four graduate students. Thus, the goal of the symposium was well reached. Furthermore, it is planned that a selected number of papers presented in the symposium will be published in the near future as lecture notes in the Springer's lecture note series.

The symposium was sponsored by Memorial University and co-sponsored by the Statistical Society of Canada (SSC), Institute of Mathematical Statistics (IMS) and Atlantic Association for Research in the Mathematical Sciences (AARMS).

- Brajendra C. Sutradhar
General Chair, ISS-2012

Participants at ISS 2012

Summer 2012 at the Atlantic Algebra Centre

Last summer was full of events in Algebra. The main one was the combination of the 11th AARMS Summer School at Memorial University, with courses in “Lie Algebras” and “Hopf Algebras”, and the AAC International Workshop “Groups, Rings, Lie and Hopf Algebras III” held at Bonne Bay Marine Station. One of the co-directors of the Summer School was the Deputy Director of AAC Dr Mikhail Kotchetov, and the selection of topics and lecturers for the algebra portion of the School was done in close consultation with the Board of Directors of AAC. Moreover, two lecturers of the School were among the seven plenary speakers of the Workshop.

The report of the School being a separate matter, I would like to say more about the Workshop. This was the third workshop held in the hospitable environment of Bonne Bay Marine Station. Situated in the heart of Gros Morne National Park, the Station has everything necessary for a scientific event with around 30 participants. This time we had participants from eight countries: Belgium, Brazil, Canada, Israel, Italy, Poland, Spain and USA. There were 14 one-hour lectures and a number of shorter research talks and communications. Five of these were given by students of the AARMS Summer School (altogether, we had 8 Summer School students with us). Because many participants lived in the Station, there were many opportunities for informal discussions. There was also some time for sightseeing in Gros Morne National Park, the central event being the boat tour of Western Brook Pond. Many of the lectures given at the Workshop are now available on the website of Atlantic Algebra Centre at http://www.mun.ca/aac

Having famous algebraists around was a good opportunity for organizing a Public Lecture at MUN, some Departmental Colloquia and Algebra Seminars, given by Professors Alberto Elduque (Spain), Nicholas Andruskievitsch (Argentina) and Leandro Vendramin (Argentina). A barbecue organized by the Department’s Interim Head Edgar Goodaire was a good time for Summer School’s students to socialize with professors, both local and visiting, and to hand book prizes to the winners of the 2012 AAC Undergraduate Algebra Competitions. These were Gaelan Hanlon from UNBF (front left) and Jonathan Lomond (front right) from MUN on the picture below.

One good piece of news came in September from the AMS: a book of Alberto Elduque and Mikhail Kochetov “Gradings on Lie Algebras” has been accepted for publication by the AMS. Discussion are in process as to which book series it would fit best in. This book is based on two mini courses at Atlantic Algebra Centre delivered by the authors, 2008–2009.

The most recent event that took place at Atlantic Algebra Centre is the XIV AAC mini course "Tropical linear algebra and its applications" given by Professor Alexander Guterman (Moscow State University) on October 1-5. The mini course attracted students and specialists from various branches of Mathematics and Statistics. We also supported the travel of one student from Dalhousie University. As usual for our fall mini courses, the lecturer suggested further reading and topics for research and course projects to the graduate students at the Department of Math & Stats of MUN.

Our next event is the AARMS Session attached to the Science Atlantic Computer Science and Mathematics meeting at Mount Allison University (October 12 – 13, 2012). Namely, we are organizing an AAC mini conference “Combinatorial Theory of Groups and Hopf Algebras” on October 14. We expect about 20 participants. The three main speakers are leading specialists from the area who work at universities in the United States: Alexander Olshanskii, Olga Kharlampovich and Alexei Miasnikov.

- Yuri Bahturin

Collaborative Research Group in Mathematical Ecology & Epidemiology

The AARMS collaborative research group (CRG) in Mathematical Ecology and Epidemiology was formed in 2011 to build on research ties in Mathematical Biology between groups at the University of New Brunswick and Memorial University, Newfoundland. Although the group is centred at these two Atlantic Canadian Universities, it has an international membership. The group has had an active and productive year, with several visitors and a successful summer minicourse. Wendi Wang, from Southwest University, Chongqing, China, visited the group at Memorial University. In March, Mark Lewis, from the University of Alberta, visited the group at UNB Fredericton and gave the annual Ken Ireland Memorial Lecture. At the same time, Yuxiang Zhang and Zhen Wang, graduate students from Memorial, also visited UNB, gave seminars and attended the Ireland lectures. During the week of August 13, Prof. Junping Shi, from the College of William and Mary, delivered a set of excellent lectures for a Summer Mini-Course on Bifurcation Theory and its Applications at the University of New Brunswick. The lectures covered an introduction to bifurcation theory and its application to problems in ordinary, partial and delay differential equations arising from biological applications. Fourteen graduate students and postdoctoral fellows from Laurier, Memorial, Western, York and UNB participated the mini course. At the end of the course, two excellent group projects were presented and a joint paper by participants is in preparation. Following the mini-course, most of the participants went together to the AARMS workshop on Mathematical Biology held at Dalhousie University.

- James Watmough

Recent and Upcoming Events

24th Canadian Conference on Computational Geometry
Organizers: Greg Aloupis and David Bremner
Location: Memorial University, Saint John's
Date: August 8-10, 2012
Contact Information: Greg Aloupis

Groups, Rings, Lie and Hopf Algebras III
Organizer: Yuri Bahturin, Mikhail Kotchetov
Location: Memorial University, Bonne Bay Marine Station
Date: August 12-18,2012
Contact Information: Yuri Bahturin

Workshop on Mathematical Biology
Organizers: David Iron, Theodore Kolokolnikov, James Watmough, Sina Adl
Location: Dalhousie University
Date: August 18-19, 2012
Contact Information: David Iron

Atlantic Conference on Dynamical Systems
Organizers: Alan Coley, David Iron, Theodore Kolokolnikov
Location: Dalhousie University
Date: August 20-22, 2012
Contact Information: Alan Coley

Noncommutative Geometry
Organizers: Colin Ingalls, N. Higson, M. Lesch, B. Rangipour
Location: University of New Brunswick, Fredericton
Date: August 25 - Sept 5, 2012
Contact Information: Colin Ingalls

2012 Science Atlantic Mathematics, Statistics and Computer Science Conference
Organizers: Mount Allison Department of Mathematics and Computer Science
Location: Mount Allison University, Sackville
Date: October 12 - 13, 2012
Contact Information: Robert Rosebrugh

Combinatorial Theory of Groups and Hopf Algebras
Organizers: Yuri Bahturin, Mikhail Kotchetov
Location: Mount Allison University, Sackville
Date: October 13 - 14, 2012
Contact Information: Yuri Bahturin

Sustainability of Aquatic Systems Networks
Organizers: Frithjof Lutscher, James Watmough
Location: University of New Brunswick, Fredericton
Date: April 22-26, 2013
Contact Information: Frithjof Lutscher

Analytic Spaces and Their Operators
Organizers: Jie Xiao, Kehe Zhu
Location: Memorial University, St. John's
Date: July 9-12, 2013
Contact Information: Jie Xiao

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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With my full philosophical rucksack I can only climb slowly up the mountain of mathematics. ~Ludwig Wittgenstein, Culture and Value