Atlantic Association for Research in the Mathematical Sciences

Research - Outreach - Community

Newsletter

Winter 2012

Collaborative Research Group: the Atlantic Algebra Centre

Since September 1, 2011, the Atlantic Algebra Centre has been receiving support from AARMS as a Collaborative Research Group. At present our membership has grown to 15 faculty members, many of whom supervise undergraduate and graduate students as well as postdoctoral fellows. We also expanded the scope of our activities and at the end of 2011 we held our first competition for the AAC/CRG graduate prizes designed to encourage graduate students from Maritime Provinces in productive research in Algebra. See page 3 for details of these awards.

The main event in 2011 was the VI AAC International Workshop "Polynomial Identities in Algebras. II", held in St. John's, NL, on September 2 - 6, 2011. The full report for the workshop is available on the AARMS web site. Our main events in 2012 are planned to be the following.

- The XII AAC mini course "Non-commutative Cryptography" will be given by Professor Vladimir Shpilrain (City College of New York, NY, USA) on February 26 - March 3, 2012.
- The XIII AAC mini course "Growth of Groups and Related Topics" will be given by Professor Rostislav Grigorchuk (Texas A & M University, USA) on May 6 - 12, 2012.
- The VII AAC International Workshop "Groups, Rings, Lie and Hopf Algebras III" will be held at Bonne Bay Marine Station of Memorial University of Newfoundland in Norris Point, NL, from August 12 - 18, 2012. This workshop is a follow-up of an AARMS Summer School course to be held at Memorial University in July - August 2012.

As usual, in March, we conduct our Sixth Undergraduate Algebra Competition for the students of the universities of Atlantic Canada. The winners will be awarded book prizes and invited to attend AAC mini courses.

One of the notable events in the life of AAC became the submission of the first book in the AARMS/AMS Book Series written by the AAC mini course lecturers Dr Alberto Elduque (University of Zaragoza) and Dr Mikhail Kotchetov (MUN). The title of the book is "Gradings on Simple Lie Algebras".

Details of upcoming AAC activities can be found on the AAC website: www.mun.ca/aac

- Yuri Bahturin

New Faculty and Other News From Memorial University

This has been an exciting year for Mathematics and Statistics at Memorial. In the fall, we welcomed five new faculty members: Tanareh Abarin (statistics), Hari Kunduri (mathematical physics), Eduardo Martinez-Pedroza (geometric group theory and low dimensional topology), Hamid Usefi (algebra) and Deping Ye (analysis). Later, we learned with pride that Dr. Danny Summers (theoretical space physics) had been named Fellow of the Royal Society of Canada, that Dr. Jie Xiao (analysis) had become this department's sixth university research professor and then that Danielle Leonard, one of our best students, has been named Newfoundland Rhodes scholar for 2012. These are wondrous times for the Province of Newfoundland of Labrador, for Memorial University and especially for the Department of Mathematics and Statistics---proud hosts to the 2012 AARMS Summer School.

- Edgar Goodaire

New Faculty at Memorial University. Left to right: Hari Kunduri, Hamid Usefi, Tanareh Abarin, Eduardo Martinez-Pedroza, Deping Ye

News

Math Outreach Reaches Out

On February 2nd grades six to ten students of Chipman Forest Avenue School were fortunate to be part of a math outreach initiative which saw UNB Faculty of Education professor, John Grant McLoughlin and two recent graduates of UNB's BEd program, Kelda Smith and Kyle Smith, come to the school to share a wonderful selection of mathematically stimulating games, puzzles, and challenges. The day was an enormous success with students and staff alike.

With increased emphasis being directed to improving students' problem solving skills, the challenges presented during the event certainly promoted a variety of problem solving strategies, such as guess and check, working backwards, and logical reasoning, to name a few. One trait of good problem solvers is determination, and this quality was supported throughout the sessions with encouragement and occasional individual hints to help students push through and not give up. The satisfaction experienced by students upon the successful solving of a puzzle was delightful to witness.

While New Brunswick's Geometry, Measurement and Finance 10 curriculum document is the only one specifically naming puzzles and games as part of the program of studies (Geometry Outcome 1: Analyze puzzles and games that involve spatial reasoning, using problem-solving strategies), it is important that mathematical puzzles, games, and challenges be regularly integrated into students' days regardless of grade level.

The students and staff of Chipman Forest Avenue School, located approximately 80 km northeast of UNB's Fredericton campus, and on the outskirts of School District 17, would like to express their heartfelt gratitude for the opportunity to be part of the Math Outreach initiative. We look forward to building upon this experience through a subsequent visit scheduled later this winter.

- April Wilson, numeracy lead teacher, School District 17

High school students celebrating their problem solving success

AARMS Postdoc works on Global Analysis of Virus Dynamics

We are interested in a general within-host model which was primarily proposed to study the AIDS epidemic and HIV infection. Let T, T_i and V denote the concentration of uninfected T cells, productively infected T cells, and free virus particles in the blood, respectively. We investigate on the following three-dimensional dynamic system:

$$\begin{aligned} T'(t) &= f(T,V) - k_1 h(T) g(V), \\ T_i'(t) &= k_1 h(T) g(V) - p(T_i), \\ V'(T) &= Np(T_i) - q(V) - k_2 h(T) g(V). \end{aligned}$$

Here the nonlinear function $f(T,V)$ denotes the intrinsic growth rate of the uninfected target cells, which includes production of new cells, natural mortality of cells and the stimulation of T cells to proliferate in the presence of virus. The infection process is characterized by the incidence function $k_1 h(T) g(V)$ where $k_1 h(T)$ counts the number of contacts between viruses and uninfected T cells and $g(V)$ denotes the force of infection by virus. Note that this incidence function generalizes many commonly used incidence functions such as mass action incidence. We assume that the death function for infected cells is $p(T_i)$, and prior to death, each infected cell produced N new virions. $q(V)$ denotes the natural death of the virus. Finally, the term $k_2 h(T) g(V)$ represents the loss of free infectious virion when they enter target cells.

Several questions arise from global analysis of the virus dynamics and will be answered in our research project:

- Given nonnegative reasonable initial conditions, will the solutions to the dynamic system remain nonnegative and bounded?
- Under what condition will the virus be cleared? When will the infection free equilibrium be globally stable?
- Is there any persistent equilibrium? If so, is it uniquely existed? And when will this persistent equilibrium be globally stable?
- If further, the conditions for global stability of persistent equilibrium are violated, is it possible to provide any global bifurcation theory for the dynamical system?

Hongying Shu received her PhD from Harbin Institute of Technology (China) in 2010. She is working as an AARMS PDF at the University of New Brunswick under the supervision of Lin Wang and James Watmough.

News from Dalhousie University

Dalhousie's Department of Mathematics and Statistics looks forward to a busy summer. The 2012 SIAM Meeting on Discrete Mathematics takes place on the Dalhousie Campus from June 18 to 21. The local organizers for this large international meeting, which is expected to attract about 400 participants, are Jason Brown, Jeannette Janssen, and Richard Nowakowski. This is followed by the 9th Workshop on Algorithms and Models for the Web Graph, June 22-23, organized by Jeannette Janssen.

As every Summer, two math camps will be hosted by the department. The CMS Math Camp, for high school students who have finished grades 10 or 11, will take place July 8-13. The organizers are C. Sastri, Suraj Sikka, and Roman Smirnov. This is followed by the BEA (Black Educators Association of NS) Math Camp, July 15-20, organized locally by R.P. Gupta.

A new kind of seminar was recently initiated by Richard Nowakowski. The "International Combinatorial Game Theory Seminar" meets every two weeks on the participants' own computers, linked together by well-known and easy to use communications software. So far, 10 sites in 6 different countries between Canada and Israel have participated. For further information, please contact Richard.

The NS Math Circles, coordinated by Danielle Cox, continues to be very active at this Department's home base, and on the road. Danielle and her team have visited numerous high schools right across the Province, and once a month there is an early-evening event in the Student Resource Centre in our department. Related to this, the Math Fun Days will take place on Campus from May 16 to 18. For the first time this year, it will be preceded by a day of activities in French, for the francophone school boards in the region.

Last but not least, the final event for the Nova Scotia Math League, organized by John Irving of SMU, will be held in the Dalhousie Math & Stats Department on Saturday, April 21st. It will bring together teams of high school students from across the province.

- Karl Dilcher

Call for Proposals

We encourage mathematicians in Atlantic Canada to suggest programmes or themes for future AARMS activities in the region (workshops, conferences, periods of specialization and exceptional opportunities) and to direct all applications for funding to our Online System. Proposals are usually expected to show a detailed program with a significant number of confirmed speakers. They must also include a budget table showing projected total revenues and expenses. In general AARMS is not in a position to fund indefinite continuing activities. Successful applicants will be expected to produce a report on their event. The next deadline for submission: May 15, 2012.

For more details please visit www.aarms.math.ca/events

News from the University of New Brunswick

Faculty member Hugh Thomas, who is also a member of AARMS' SRP, is a co-recipient (with Alexander Yong) of the 2011 G. de B. Robinson Award of the Canadian Mathematical Society for their paper “Multiplicity-Free Schubert Calculus”, published in the Canadian Mathematical Bulletin (53:1 2010, 171-186; http://dx.doi.org/10.4153/CMB-2010-032-x).

Former graduate student Andreas Kreienbuehl, who completed his PhD in 2011 received the Governor General’s Gold Medal for outstanding achievement in graduate studies. His thesis was co-supervised by Viqar Husain and Sanjeev Seahra. Dr. Kreienbuehl is now a post-doctoral fellow in the quantum gravity research group of Professor Renate Loll at the University of Utrecht.

- Viqar Husain

Graduate Prizes at the Atlantic Algebra Centre

In connection its support as an AARMS Collaborative Research Group, the Board of Directors of AAC has established the AAC - CRG Graduate Prizes to support the research of the Algebra graduate students working in Atlantic Canada. The result of the 2011/12 competition is as follows:

First Prize worth $1,000 goes to
Mr Serkan Sutlu of UNB - Fredericton
Second Prize worth $750 goes to
Ms Emma Connon of Dalhousie University
Third Prize worth $500 goes to
Mr Ali Alilooee of Dalhousie University

AARMS Summer School

The eleventh annual AARMS Summer School will be held at Memorial University in St. John's, Newfoundland and Labrador, from July 16 to August 10, 2012. The summer school is intended for graduate students and promising undergraduate students from all parts of the world. Each participant is expected to register for two of the courses. Each course consists of five ninety-minute lecture sessions each week. These are graduate courses approved by MUN and we will facilitate transfer credit to the extent possible. Four courses will be offered:

Combinatorial Designs and Graph Decompositions
Instructor: Darryn Bryant (Queensland)
Probabilistic Method and Random Graphs
Instructor: Pawel Pralat (Ryerson)
Lie Theory
Instructor: Alberto Elduque (Zaragoza)
Hopf Algebras and Applications
Instructors: Nicolas Andruskiewitsch (Cordoba)
and Leandro Vendramin (Buenos Aires)

www.aarms.math.ca/summer

Recent and Upcoming Events

Atlantic General Relativity Conference
Organizers: Jack Gegenberg, Viqar Husain, Ivan Booth
Location: University of New Brunswick, Fredericton
Date: April 28-29, 2012
Contact Information: Jack Gegenberg

East Coast Combinatorics Conference 2012
Organizer: Danny Dyer
Location: Memorial University, St John's
Date: May 9-11, 2012
Contact Information: Danny Dyer

Annual Meeting of the Statistical Society of Canada
Organizers: Brian Allen, Alexendre Leblanc, Tim Swartz, John Brewster
Location: University of Guelph
Date: June 3-6, 2012
Contact Information: Brian Allen

Foundational Methods in Computer Science
Organizers: Peter Selinger, Dorette Pronk
Location: Dalhousie University, Halifax
Date: June 14-17, 2012
Contact Information: Peter Selinger

SIAM Conference on Discrete Mathematics
Local organizers: Jeannette Janssen, Jason Brown, Richard Nowakowski
Location: Dalhousie University, Halifax
Date: June 18-21, 2012
Contact Information: Jeannette Janssen

Workshop on Algorithms and Models for the Web Graph
Organizer: Jeannette Janssen
Location: Dalhousie University, Halifax
Date: June 21-22, 2012
Contact Information: Jeannette Janssen

Combinatorial Games Workshop
Organizer: Richard Nowakowski
Location: Dalhousie University, Halifax
Date: June 22-26, 2012
Contact Information: Richard Nowakowski

14th Cdn Conference on General Relativity and Relativistic Astrophysics (CCGRRA 14)
Organizers: Ivan Booth, Hari Kunduri, Benjamin Tippett
Location: Memorial University, St. John's
Date: July 9-12, 2012
Contact Information: Ivan Booth

International Symposium in Statistics
Organizer: Brajendra Sutradhar
Location: Memorial University, St. John's
Date: July 16-18,2012
Contact Information: Brajendra Sutradhar

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Film is one of the three universal languages, the other two: mathematics and music. *~Frank Capra*