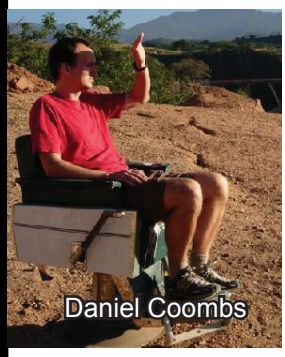
PIMS MAGAZINE

Volume 13 - Issue 1 - June 2010

PIMS awarded $1.2M by Alberta Government

The Alberta Ministry of Advanced Education and Technology has awarded $1.2 million in support of PIMS programs in Alberta for the period 2010-2013. These funds will support a variety of activities including postdoctoral positions, graduate fellowships in mathematical biology, industrial short courses and summer schools, as well as multiple scientific, educational and outreach events.

PIMS Director Alejandro Adem noted: “This grant represents an important source of support for PIMS researchers in Alberta, complementing our core funding from NSERC. The scientific activities that will take place in Alberta under PIMS sponsorship will be in fields such as number theory, quantum information theory, wavelets, seismic imaging and data mining in public health. Our education activities will impact teachers and students across the province, while our industrial events will help develop collaborative partnerships with the private sector. We are extremely grateful to the Government of Alberta for their generous funding as well as to the University of Alberta and the University of Calgary for their crucial support.”


Daniel Coombs

Daniel Coombs Awarded 2010 CAIMS/PIMS Early Career Award in Applied Mathematics

The Canadian Applied and Industrial Mathematics Society (CAIMS) and PIMS are pleased to announce that Daniel Coombs of the University of British Columbia has been selected as the recipient of the inaugural 2010 CAIMS/PIMS Early Career Award in Applied Mathematics. This award recognizes exceptional research in any branch of applied mathematics where the recipient is less than ten years past the date of Ph.D. at the time of nomination.

Coombs is cited for his creativity, productivity, and ever-growing impact in mathematics applied to problems in biology. He works in the field of computational immunology, addressing a wide range of problems in viral disease dynamics and HIV modelling, and in the dynamics of receptors on cell surfaces.

Coombs obtained his PhD in 2001 from the University of Arizona, held a postdoctoral position at Los Alamos National Laboratories (2001-03), and joined UBC in 2003, where he is currently an Associate Professor in the Department of Mathematics.

The award will be presented at the CAIMS Annual Meeting at Memorial University at St. John’s on July 17-20, 2010. Coombs will deliver a plenary lecture at the meeting as part of the award ceremony.

HIGHLIGHTS

DIRECTOR'S BLOG


Alejandro Adem

As readers may know, the major scientific offerings at PIMS are the Collaborative Research Groups, which bring together clusters of faculty at PIMS universities to organize international thematic events such as workshops and summer schools, as well as recruit postdoctoral fellows. As you will read in this newsletter, two new CRGs have just started at PIMS, on the respective topics of Mathematics of Quantum Information and L-functions and Number Theory. Both of these groups will build on considerable strengths in Western Canada and attract world class visitors to our universities.

In fact Alberta looms large at PIMS not only for its scientific leadership: just a few weeks ago we obtained significant funding ($1.2 million) from the Ministry of Advanced Education and Technology in Alberta to fund PIMS activities over the next few years, providing a major boost to our colleagues in that province.

Meanwhile at UBC the new building which will house PIMS is on track for completion in 2012. Endless meetings to discuss construction details are taking place, and an amazingly beautiful design has emerged which will represent a quantum leap in the quality of our facilities (with apologies to the venerable West Mall Annex...)

In this newsletter you will read about the accomplishments of Andy Liu, 2010 PIMS Education Prize winner and a remarkable educator.

Likewise we report on the very first winner of the CAIMS-PIMS Award in Applied Mathematics, bestowed upon Daniel Coombs, who is a rising young star in Canadian mathematics.

As folks may be aware, PIMS has a vigorous educational outreach program designed to enhance the mathematical opportunities for students and teachers in K-12. One important aspect is our involvement in science fairs; PIMS sponsors these events at different venues in Canada. To illustrate the impact these efforts can have, I quote from a letter we received from a recent young winner in Vancouver: “Receiving the PIMS Applied Mathematics Award has become a source of inspiration and motivation in my academic life.” Another pair of winners write: “We hope you continue to sponsor this worthy cause and inspire new brilliant minds with your generosity.” To which I can only say, thank YOU for your enthusiasm and love of mathematics!

In a similar vein, over the past few years PIMS has been organizing summer camps in British Columbia for Aboriginal/First Nations students. This successful program would not be possible without the support of some very generous donors, and so I want to end by publicly thanking key individuals whose donations have made this program possible: Darrell Duffie, Haig Farris, Ken Spencer and Andy Wright as well as our corporate sponsors at TD Bank and CIBC.

Warmest Regards,

Alejandro Adem
Director, PIMS

PIMS Launches Two New CRGs

PIMS is pleased to announce the launch of two new Collaborative Research Groups (CRGs) for the period 2010-2013. These CRGs will focus on "The Mathematics of Quantum Information" and "L-functions and Number Theory," and are organized by researchers from the University of Calgary as well as other PIMS universities.

Barry Sanders

In an age ruled by advancements in online information exchange, information security is tantamount. Both of these CRGs are working to fill deficits that exist in the mathematics of information security. "There are mathematical problems that, if solved, could show how to create and trust new means for secure communication," says Barry Sanders, who is the CRG leader as well as Professor of Physics and Director of the Institute for Quantum Information Science at the U of C. "The societal problem is that, from e-commerce to the battlefield, we rely on encryption to communicate secretly through public channels, but our belief in security relies on assumptions about the hardness of breaking the codes. In other words, our trust is not proven but rather 'believed.' Much effort goes into proving security under certain conditions or breaking security in other conditions."


Matthew Greenberg

Number theory, the topic of the CRG run by Matthew Greenberg, Assistant Professor in U of C's Department of Mathematics, examines problems that are inherent in natural numbers. "Numbers form the alphabet of the digital world. Although each individual character in this alphabet is extremely simple, the subtle properties of the language they form are directly responsible for the utility of number theory in the field of digital communications: every credit card transaction, every email sent, relies on number theory to ensure it is transmitted securely," says Greenberg.

Both CRGs were launched at a celebration hosted by the Department of Mathematics and Statistics at U of C on April 6. The event included public lectures by Gilles Brassard of the Université de Montréal and Eyal Goren of McGill University.

A list of their planned 2010 activities can also be found on page 5 of this magazine. Further information about these CRGs can be found on the overleaf and on the web at:

www.pims.math.ca/scientific/collaborative-research-groups/mathematics-quantum-information-2010-2013

&

www.pims.math.ca/scientific/collaborative-research-groups/number-theory-2010-2013.

PIMS CRG on The Mathematics of Quantum Information

Quantum information science is an interdisciplinary research endeavour that brings together computer scientists, mathematicians, physicists, chemists, and engineers to develop revolutionary information processing and communication technologies that crucially exploit the principles of quantum mechanics. The importance of quantum information was first widely recognized in 1982 when Feynman conjectured that a quantum computer would efficiently simulate quantum systems, and a universal Turing machine ("classical computer") could not.

In the mid-1990s, Shor showed that a quantum computer could efficiently determine the factors of large numbers whereas this problem is believed to be intractable on a classical computer. Even earlier, in 1984, Bennett and Brassard proposed an information-theoretically secure key distribution technique through public channels, as opposed to standard methods that are only computationally secure. Originally proposed in 1984, quantum cryptography has since become commercial technology.

This CRG is ideally suited to address and make significant progress in areas such as models of quantum computing, error correction and quantum algorithms. It is led by Barry Sanders (U Calgary), Robert Raussendorf (UBC), Petr Lisonek (SFU) and Dave Bacon (U Washington), and will be active from 2010 - 2013.

PIMS CRG on L-Functions and Number Theory

Number theory is a subject as diverse as it is ancient, and this diversity is well represented in the mathematics departments of PIMS universities. These universities are home to academics with expertise in algebraic and analytic number theory, arithmetic algebraic geometry, computational number theory, number theoretic cryptography and information security, and representation theory, and have long-held reputations for producing cutting-edge research in these fields. Much has changed, though, in the arithmetic landscape of Western Canada since PIMS last funded activities in number theory. An influx of new, young researchers into PIMS universities, particularly in Alberta, has added to the region's already impressive list of accomplished number theorists. PIMS feels the time is ripe to bring all of these mathematicians together again under the umbrella of a CRG to encourage the development of promising young faculty and their work, while continuing to promote the number theoretic excellence for which Western Canada is acknowledged worldwide.

The coordinator of the CRG is Matthew Greenberg of the University of Calgary, and the scientific advisory committee consists of William Casselman (UBC), Stephen Kudla (U Toronto), Ram Murty (Queen's U), Bjorn Poonen (MIT) and Vinayak Vatsal (UBC). Other principal investigators are Amir Akbary (U Lethbridge), Nils Bruin (SFU), Clifton Cunningham (UC), Charles Doran (UA), and Greg Martin, Lior Silberman and Vinayak Vatsal (all of UBC). The CRG will run from 2010 - 2013

CRG Activities in 2010

CRG on Differential Geometry and Analysis:

PRIMA Conference on Geometric Analysis, July 20–30, UBC

CRG on Environmetrics:

Workshop on the Creation of a PIMS Environmetrics Research & Training Centre, April 10, SFU Vancouver

CRG on Bayesian Modelling and Computation for Networks:

Modelling and Computation for Social Networks, June 21–25, Whistler, BC

Social Networks Workshop, June 25–26, Whistler, BC

CRG on Operator Algebras and Non-commutative Geometry:

Workshop on Non-commutative Dynamics and Quantum Probability, May 14–17, U of R

Summer School on Operator Algebras and Non-commutative Geometry, June 14–25, U Vic

Conference on Selected Topics in Non-commutative Geometry, June 27–July 2, U Vic

CRG on Number Theory:

PIMS Calgary CRG Launch, April 6, U of C

Alberta Number Theory Days, April 30–May 2, Banff, AB

West End Number Theory Seminars, U of C

UBC-SFU Number Theory Seminar

CRG on The Mathematics of Quantum Information:

PIMS Calgary CRG Launch, April 6, U of C

10th Canadian Summer School on Quantum Information, July 17–30, UBC

Workshop on Quantum Algorithms, Computational Models, and Foundations of Quantum Mechanics, July 23–25, UBC

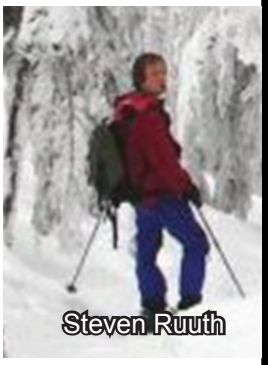
Quantum Information Seminar Series, U of C

Steven Ruuth Appointed PIMS SFU Site Director

The Pacific Institute for the Mathematical Sciences is pleased to announce that Steven Ruuth, Professor of Mathematics at Simon Fraser University, has been appointed interim PIMS site director for the period May 1, 2010 - June 30, 2011.

Ruuth will be replacing Rustum Choksi, who will be moving to McGill University and who has served as PIMS-SFU site director since 2005. The entire PIMS community is grateful to Choksi for his excellent service over all these years.

Ruuth is a renowned specialist in applied and computational mathematics. He obtained his Ph.D. from UBC in 1996 and held a postdoctoral position at UCLA (1996-1999), after which he joined the faculty at Simon Fraser University.


Steven Ruuth

2010 PIMS Post-Docs Announced

PIMS is proud to announce the appointment of 13 new Postdoctoral Fellowships for 2010. The high calibre of submissions this year made the adjudication especially challenging. The PIMS community would like to thank the PIMS postdoctoral committee for the many hours spent making difficult decisions.

PDF	Research Topic	Supervisor
Benjamin Adcock	Numerical Analysis	Nilima Nigam (SFU)
Vianney Combet	CRG 19 - Partial Differential Equations	Tai-Peng Tsai (UBC)
Pavel Hrubes	Information and Communication, Circuits	Robin Cockett (UC)
Johnson Jia	CRG 21 - Number Theory	Vinayak Vatsal (UBC)
Antoine Julien	CRG 20 - Noncommutative Geometry and Operator Algebras	Ian Putnam (UVic)
Xiaoguang Ma	Associative Rings and Algebras	Nicolas Guay (UA)
Benjamin Marlin	CRG 18 - Bayesian Statistics	Kevin Murphy (UBC)
Tom Meyerovitch	Dynamical Systems and Ergodic Theory	Brian Marcus (UBC)
Diego Ribeiro Moreira	CRG 19 - Partial Differential Equations	Young-Heon Kim (UBC)
Pavel Semukhin	Mathematical Logic and Foundations	Sandra Zilles (UR)
Cecilia Gonzalez Tokman	Dynamical Systems and Ergodic Theory	Anthony Quas (UVic)
Kirsten Valkenburg	General Topology	E. D. Tymchatyn (USask)
Ian Zwiers	CRG 19 - Partial Differential Equations	Stephen Gustafson (UBC)

2010 IGTC Fellows Announced

The PIMS International Graduate Training Centre (IGTC) in Mathematical Biology is pleased to award 8 new graduate fellowships. The recipients of the 2010 IGTC Graduate Fellowships are:

Lyudmila Korobenko (UC)
Anastasia Lukyanova (UA)
Benjamin Wilson (UVic)
Deniz Yorukoglu (SFU)
Phuong Dao (SFU)
Eric Foxall (UVic)
Monica Itzuri Delgado Carrillo (UBC)
Sheehan Khan (UA)

Key IGTC elements include annual research summits, summer courses, new term-time courses, seminars, graduate student exchanges, and international visitors. Graduate students engaged in mathematical biology training are encouraged to enroll in the IGTC program. More details are available on the IGTC Program page at:

www.pims.math.ca/scientific/graduate-training-igtc/mathematical-biology

Andy Liu Awarded 2010 PIMS Education Prize

The winner of the 2010 PIMS Education Prize is Andy Liu from the University of Alberta. This prize is intended to recognize individuals from the PIMS universities, or other educational institutions in Alberta, British Columbia, and Saskatchewan who have played a major role in encouraging activities which have enhanced public awareness and appreciation of mathematics, as well as fostering communication among various groups and organizations concerned with mathematical training at all levels.

Liu is an outstanding mathematical educator who has been internationally recognized for his tireless work in education and outreach over a period of many years. He is a winner of the Deborah and Franklin Tepper-Haimo Award from the Mathematical Association of America (2004), the Adrien Pouliot Award from the Canadian Mathematical Society (2003), the Distinguished Teaching Award from the Pacific Northwest Section of the MAA (2002), the Delta Chi Teaching Excellence Award (2000), the 3M National Teaching Fellowship (1999), and was Canadian University Professor of the Year (1998). He was also the leader of the Canadian teams to the International Mathematical Olympiad in 2000 and 2003.

Liu, a professor of mathematics, has been highly influential through his popular courses for future elementary school teachers. He serves as Director of "Saturday Mathematical Activities, Recreations and Tutorials" (SMART), an enrichment program for students in Edmonton which has captured the imagination of several generations of junior high school students. He also has helped organize and promote the highly successful SNAP (Student-oriented, Non-competitive, All-inclusive, Problem-based) Math Fairs. He is Chair of the Alberta High School Mathematics Competition Board, and serves as Vice-President of the International Mathematics Tournament of Towns. He has also been the organizer for the CMS Regional Mathematics Summer Camps held in Edmonton in 2000, 2002, 2004, 2006 and 2008.

The 2010 PIMS Education Prize was awarded at a special event during the annual **Changing the Culture** conference at Simon Fraser University on May 21, 2010. PIMS is grateful to CGG Veritas & Hampson-Russell for sponsoring this award.

For more information on PIMS prizes and awards please see:

www.pims.math.ca/pims-glance/prizes-awards

PIMS Welcomes CNRS Delegation

Three French academics will be visiting PIMS institutions during 2010–2011. Emmanuel Goddard, from the Université d'Aix Marseille I, will take up residence at SFU where he will work on discrete topological methods in communication networks. At UBC, Pierre Guillot will contribute his expertise in group cohomology and algebraic geometry. He is from the Université de Strasbourg I. Also coming to UBC is Sylvain Rubenthaler. Hailing from the Université de Nice, his specialty is in probability and statistics.

These researchers come to PIMS as part of an agreement with the French Centre National de la Recherche Scientifique (CNRS), of which PIMS is a Unité Mixte Internationale.

Portland State University to Develop Leadership in Computational Mathematics and Statistics

PIMS Affiliate Portland State University's Department of Mathematics and Statistics has received a $3.9 million gift from alumnus and entrepreneur Fariborz Maseeh. Expanding upon the department's existing expertise, the gift will help develop a preeminent computational mathematics and statistics program at PSU and promote partnerships for research and innovation throughout the region. In recognition, the department has been renamed the "Fariborz Maseeh Department of Mathematics and Statistics." Maseeh's gift, with additional investment from the university, will create three new faculty positions in computational mathematics and statistics, and will also support research fellowships, colloquia and lecture series.

PIMS Co-Sponsors Summer School in Geophysical Risk Analysis

Volcanoes are much in the news these days, what with the 30th anniversary this May of the eruption of Mt St Helens, and the continuing disruptions to European travel caused by the Eyjafjoell volcano in Iceland. Thus it is timely that PIMS, along with Duke University and the NSF, will be sponsoring the **Summer School in Computer Modeling and Geophysical Risk Analysis** this August 6 - 10 at UBC.

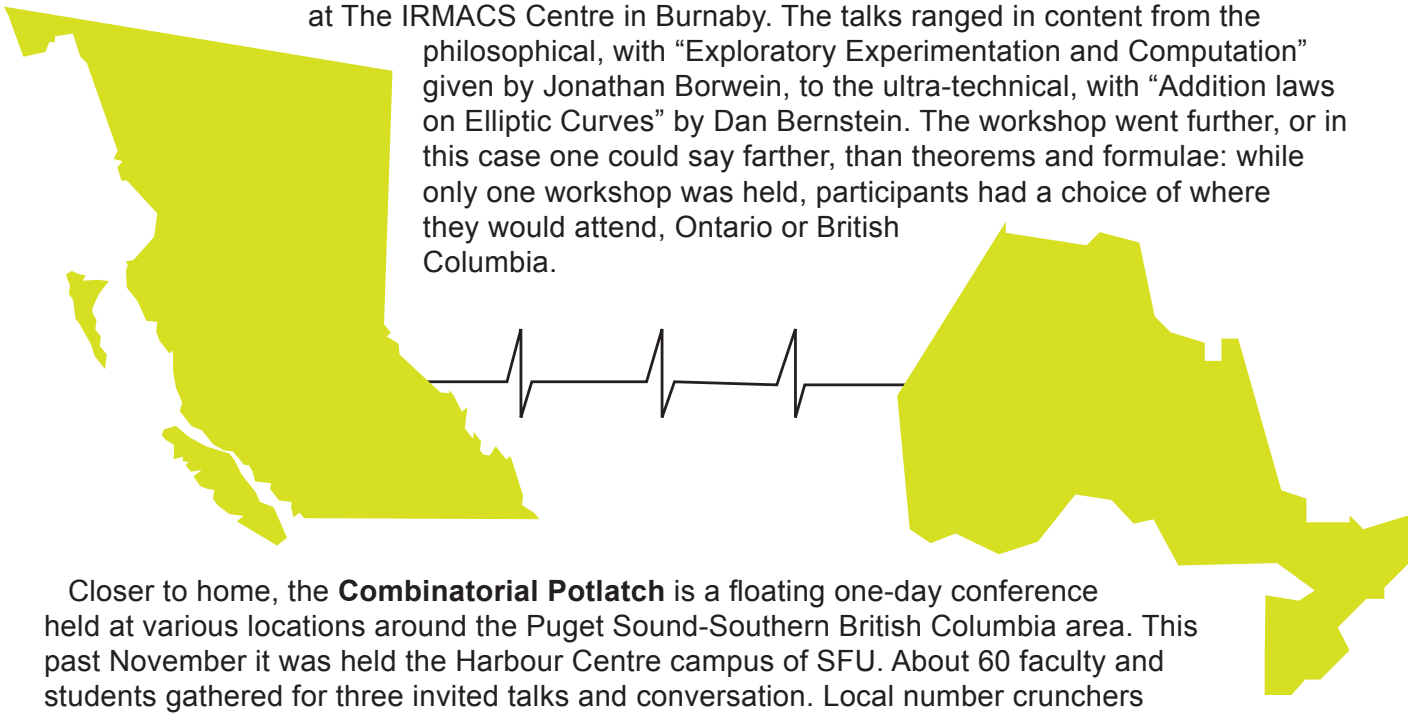
Volcanology provides an excellent scientific motivation and backdrop to investigate the collaborative application of computational models, statistical methods, and risk analysis. Volcanoes prone to pyroclastic events threaten surrounding populated regions and accurate risk analyses of possible future flow events would be of great use for civil protection.

For realistic risk analysis problems one needs to draw from physical, mathematical, and statistical models. Such models by themselves are often insufficient to capture the complexity of the underlying scientific objective. The summer school is intended to give an overview of general topics – mathematical models, computer models, and their statistical utilization – in the context of geophysical risk analysis. The goal is to expose graduate students from mathematics, statistics, and geosciences to the other disciplines and round out their experience with a multidisciplinary problem-solving session. For more information, please see the website:

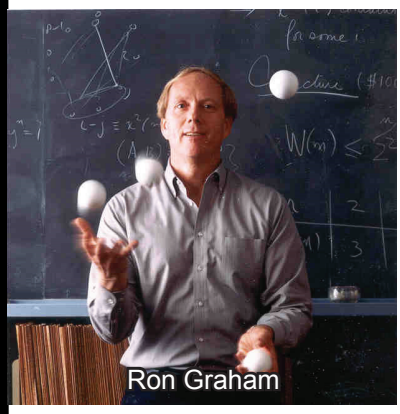
www.pims.math.ca/scientific-event/100806-sscmgra

Fall 2009/Winter 2010 Events

The September workshop on **Discovery and Experimentation in Number Theory** was held simultaneously, using remote collaboration technology, at the Fields Institute in Toronto and at The IRMACS Centre in Burnaby. The talks ranged in content from the philosophical, with "Exploratory Experimentation and Computation" given by Jonathan Borwein, to the ultra-technical, with "Addition laws on Elliptic Curves" by Dan Bernstein. The workshop went further, or in this case one could say farther, than theorems and formulae: while only one workshop was held, participants had a choice of where they would attend, Ontario or British Columbia.



Closer to home, the **Combinatorial Potlatch** is a floating one-day conference held at various locations around the Puget Sound-Southern British Columbia area. This past November it was held the Harbour Centre campus of SFU. About 60 faculty and students gathered for three invited talks and conversation. Local number crunchers attended the September edition of the **Pacific Northwest Numerical Analysis Seminar** at UBC.


Ron Graham

Other PIMS-sponsored events included October and April editions of the **Cascade Topology Seminar** which took place at the University of Oregon and Banff, the **2009 West Coast Optimization Meeting** on October 25 at SFU, and a **Mini-Symposium in PDE** at UBC and the **Bellingham Algebraic Geometry Seminar** at Western Washington University, both in November.

In October Ron Graham of the University of California at San Diego delivered the **PIMS Distinguished Chair Lecture** at UVic on the connection between the "bubblesort sorting algorithm" and certain integer sequences used to analyze various juggling patterns.

He was followed by Persi Diaconis of Stanford University, who gave the October **UW-PIMS Colloquium** on "Shuffling Cards and Adding Numbers." Diaconis noted that when several large integers are added 'carries' usually occur along the way, and asked: "About how many carries are there and how are they distributed for typical numbers?" Diaconis explained that these questions are intimately related to the mathematics of the usual way we shuffle cards.

PIMS sponsored an industrial short course on **Monte Carlo Methods for Quantitative Finance** during February in Calgary. The course focused on using Monte Carlo methods for option pricing,

Alberta Number Theory Days
Banff, April 30 - May 2

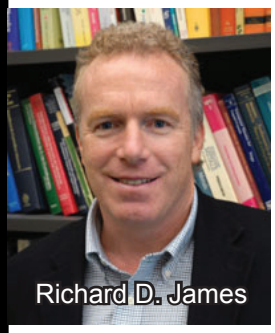
hedging and risk management. The lecturer was Tony Ware from the U. of Calgary.

The biannual **Northwest Functional Analysis Seminar** took place October 17–18 in Banff. A novelty of the seminar is that young researchers form the bulk of the featured speakers. Beginning researchers were also the focus of the **Joint SFU/UBC Graduate Student Workshops in Statistics** held in November, 2009 and April, 2010.

The **IAM-PIMS-MITACS Distinguished Colloquium** at UBC in November on "Theory and Modelling of Reactive Events" was given by Eric Vanden Eijnden of the Courant Institute of Mathematical Sciences of New York University. The December Colloquium was on "Bayesian Statistical Reasoning: An Inferential, Predictive and Decision-Making Paradigm for the 21st Century" by David Draper (University of California at Santa Cruz). In January John W. M. Bush from MIT spoke on "The Fluid Trampoline: Droplets Bouncing on a Soap Film." The last Colloquium in March was "Transport and Mixing in Complex and Turbulent Flows" by Charles Doering of the University of Michigan.

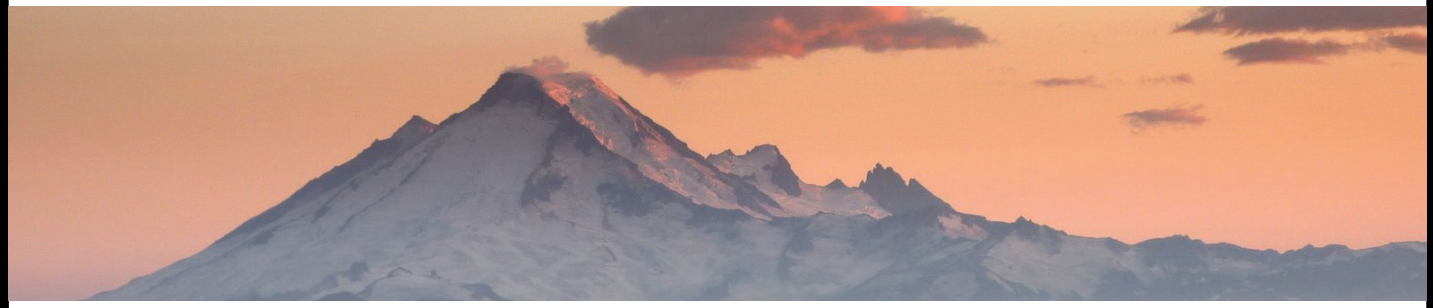

SFU/UBC Graduate Student Workshops in Statistics

The annual **Alberta Colleges Mathematics Conference** and **North South Dialogue in Mathematics** provide a good opportunity for the mathematicians at the various colleges and universities in Alberta to get together for intellectual and professional development. This April the meeting was held at Grant MacEwan University in Edmonton, and was enlivened by the public lecture "Congo Bongo" by Andy Liu of the University of Alberta.


Richard D. James

Richard D. James of the University of Minnesota was the **PIMS-CSC Distinguished Speaker** at SFU in November. He lectured on "Viscometry of bulk materials and atomic structures." The March speaker was Jack Xin from UC Irvine who talked about "Blind Source Separation Methods and Applications."


Jack Xin




Darrick Lee and Owen Lu with Mark Gotay

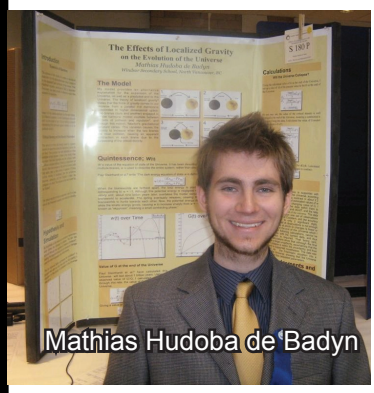
PIMS Educational Outreach Activities

The PIMS Education staff presented a series of workshops at the Vancouver School Board showing how the "Bar Model Method" can be used not only as a problem solving technique, but to develop in students a deeper understanding of fundamental concepts in mathematics. Another workshop series concerned "Lesson Studies," which have become popular in the teaching community as a means of professional development. Six working sessions were held at PIMS Central during the period from October through April.

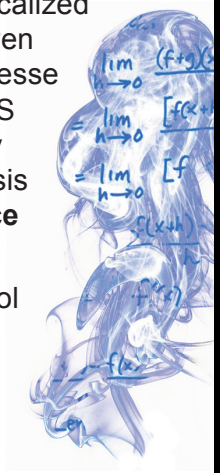
Math Mania activities took place in Victoria (twice) and a Math Mania presentation was given to about twenty teachers at the Bella Bella Community School in BC this March.

Chandler Davis and Robert Moody lectured on "Mathematics and Creative Writing" in February at UVic. About 100 graduate students, postdoctoral fellows, poets, writers, and academics attended the event.

PIMS Assistant Director Mark Gotay was on hand to award PIMS Prizes to participants at the **Greater Vancouver Regional Science Fair** in mid-April. The fair, which was held at UBC, attracted approximately 200 projects from grades 7 - 12 students across the Lower Mainland. The PIMS Prize in the senior category was shared by Mathias Hudoba de Badyn for "Effects of Localized Gravity on Evolution of the Universe" and Darrick Lee and Owen Lu for "Power Generated from a Wind Turbine." "Mesuré la vitesse de la lumière dans les matières" by Bryn Shaffer won the PIMS Prize in the Intermediate Category, and in the Junior Category the Prize went to Vincent Chen for "Hazards of H2O Electrolysis Battery." PIMS also helped sponsor the **Canada-Wide Science Fair**, held in Peterborough, ON in May.



Mathias Hudoba de Badyn



What happens when elementary school students, high school students, mathematical problems, and a little innovation are mixed together? "Mathemagicians" are developed! It's not every day that young students get excited about the subject, but a novel program developed by PIMS, with support from the UC Faculty of Education's Galileo Educational Network, brings these elements together, the result of which was showcased at a campus **Math Fair** on April 12. For the project, students in a grade 1/2 class were partnered with grade 10 mentors to work on problem-solving skills. Their mathematical investigations provided challenges to both groups of students. In working together, they found that mathematical thinking is more than a memorization of formulas or number facts – they have been involved in the rigourous work of real mathematicians. They had so much fun with the process, one student decided they should be called "Mathemagicians".

Call for Proposals

PIMS is currently welcoming applications for support of conferences, workshops, seminars, collaborative research groups and related activities in the mathematical sciences, to occur after **April 1, 2011**. Proposals must be recieved by **October 1, 2010**.

For further information, please visit:

www.pims.math.ca/scientific/call-proposals

CRM - Fields - PIMS Prize

The Centre de recherches mathématiques, the Fields Institute and the Pacific Institute for the Mathematical Sciences invite nominations for the 2011 CRM - Fields - PIMS Prize. This is the premier prize for research awarded jointly by the three Canadian mathematics institutes and recognizes exceptional achievement in the mathematical sciences. The winner receives a monetary award, and an invitation to present a lecture at each institute within one year after the award is announced.

The winner is selected by a committee appointed by the three institutes. The winner's research should have been conducted primarily in Canada or in affiliation with a Canadian university. The main selection criterion is an outstanding contribution to the advancement of research.

Nominations must be submitted by **November 1, 2010** to:

crm-fields-pims-prize@fields.utoronto.ca.

Only electronic submissions will be accepted. Further details for this prize may be found at:

www.fields.utoronto.ca/proposals/crm-fields-pims_prize.html