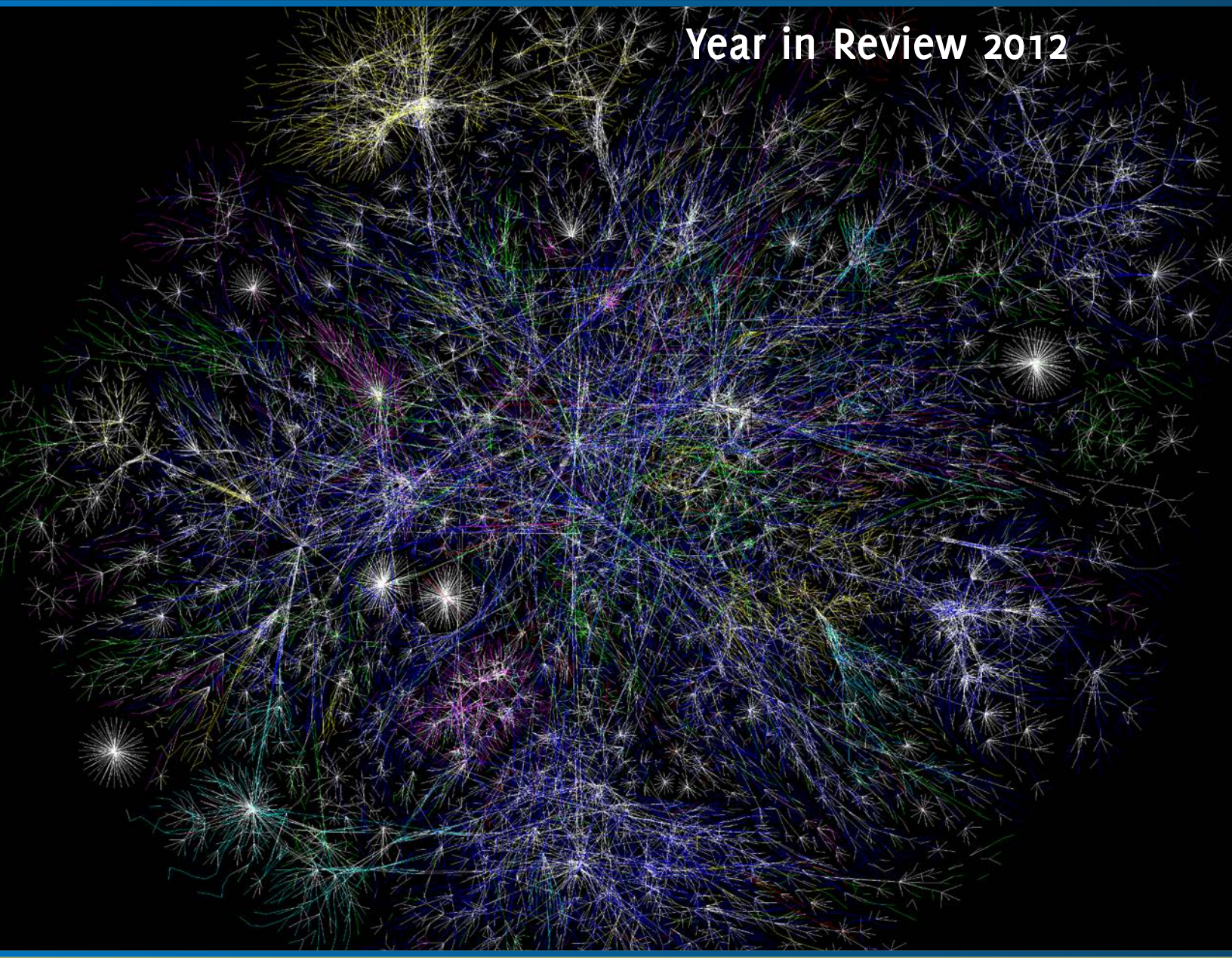
Pacific Institute *for the* Mathematical Sciences

Year in Review 2012



Simon Fraser University • University of Alberta • University of British Columbia • University of Calgary
University of Regina • University of Saskatchewan • University of Victoria • University of Washington
University of Lethbridge • Portland State University • University of Northern British Columbia

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Organization

Cover photo: Map of the Internet by the Opte Project

From the Director

The year 2012 brought many important activities and accomplishments. Our headquarters moved to a state-of-the-art facility in the new Earth Sciences Building (ESB) at The University of British Columbia. PIMS' new space in this impressive $75 million building includes a reception, offices and lab workspace as well as a dedicated videoconferencing room, a spacious lounge and an array of classrooms for seminars and workshops. We look forward to welcoming the mathematical sciences community to our new facility. Also this year, PIMS welcomed the University of Lethbridge as a full member, the ninth university in our consortium.

In 2012 we launched two new Collaborative Research Groups (CRGs): Optimization: Theory, Algorithms and Applications and Algorithmic Theory of Networks. Four other CRGs held activities during 2012 in a variety of areas such as number theory, non-commutative geometry, quantum information and applied/computational harmonic analysis.

PIMS also organized or sponsored nine summer schools. We are particularly proud of the PIMS-Mprime Probability Summer School; it was an impressive month-long event with world-class speakers and excellent international students. A detailed account appears in this Year in Review.

In July PIMS sponsored the second Marsden Memorial Lecture by Richard Montgomery, which took place at the Fields Institute, and in October we sponsored a special lecture by Les Valiant (Nevanlinna and Turing Prize winner) on occasion of the centennial of Turing's birth.

In November PIMS hosted the second Hugh Morris Lecture in Calgary, delivered by Professor Henri Darmon from McGill University. It is with great sadness that we report the recent death of Hugh Morris, former Chair of the PIMS Board, by whom this lecture series was kindly endowed.

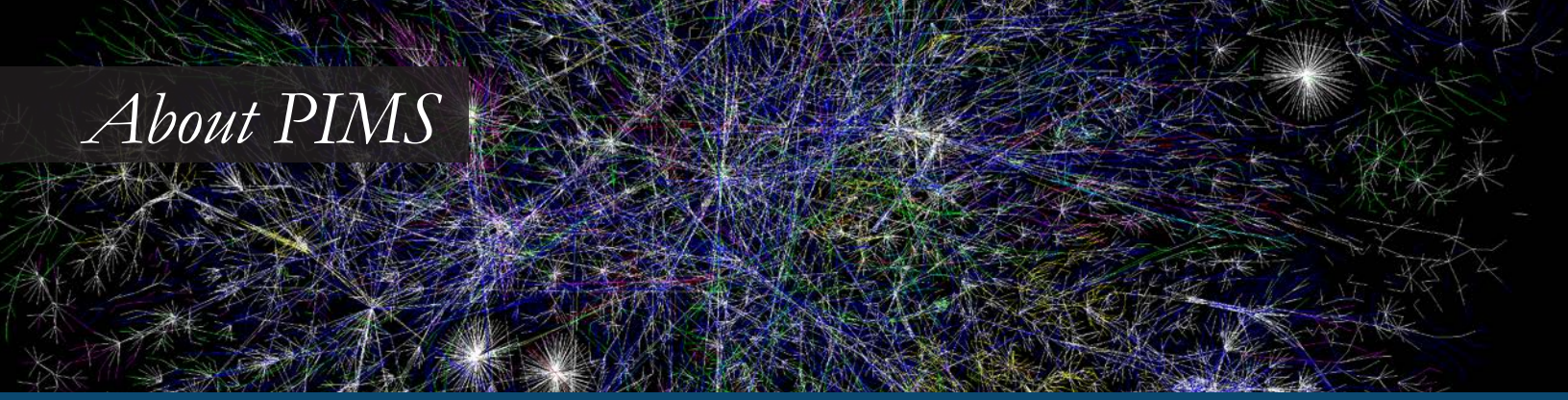
The IGTC in Mathematical Biology continued its excellent work, under the leadership of Dan Coombs. This program has trained some truly outstanding students at PIMS universities. Meanwhile, the PIMS postdoctoral program continues to attract top level talent to PIMS universities; in 2012 PIMS funded over 30 postdoctoral fellows either through CRGs or our standard competition.

In June PIMS, IMA and Mprime organized the very successful Mathematical Modeling in Industry Workshop for graduate students. This event featured industrial problems from several companies/labs. Thanks are due to Fadil Santosa (IMA Director) and the local organizers in Calgary for a superb event. A second joint IMA-PIMS-Mprime event is planned for 2014 in Vancouver.

Our educational programs are distinguished throughout Western Canada, and 2012 was a banner year. In June, the Vancouver Foundation decided to fund our programs enhancing the mathematical education of Aboriginal/First Nations students and teachers in British Columbia and in December, the Government of Saskatchewan announced funding for enhanced PIMS activities for the First Nations, Inuit and Metis population.

Let me conclude this introduction to the PIMS Year in Review 2012 by expressing our gratitude to all of our generous donors, with particular thanks to George Burke, Darell Duffie, Haig Farris, Vaho Rebassoo, Brian Russell, Sharon Dos Remedios, Ken Spencer and Andy Wright.

Alejandro Adem
Director



About PIMS

The Pacific Institute for the Mathematical Sciences was founded in 1996, it is a consortium of universities in the Pacific Northwest and Western Canada.

Member universities: Simon Fraser University, University of Alberta, University of British Columbia, University of Calgary, University of Lethbridge, University of Regina, University of Saskatchewan , University of Victoria and University of Washington.

Affiliates: University of Northern British Columbia and Portland State University.

The PIMS mandate is to promote research and applications of the mathematical sciences of the highest international caliber; to facilitate the training of highly-qualified personnel at the graduate and postdoctoral level; to enrich public awareness of mathematics through outreach; to enhance mathematical training for teachers and students in K-12; and to create mathematical partnerships with similar organizations in other countries, with a particular focus on Latin America and the Pacific Rim.

The central office is at the University of British Columbia, with a PIMS site office and a Site Director local to each of the nine member universities. The Site Director facilitates local opportunities and synergies, while the PIMS site offices provide administrative assistance for organizing local events. This distributed structure renders it quite unique, involving strong local site offices and activities, and allowing a broad impact across Western Canada and beyond.

The Board of Directors oversees the administration of PIMS, with membership consisting of the V. P. of Research from each of the member universities, as well as distinguished scientists and representatives from industry. An independent Scientific Review Panel composed of internationally renowned mathematical scientists assesses proposals for scientific events and programs.

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2012 Activity Overview

PIMS is a leading mathematical institute in North America, with worldwide impact on the mathematical sciences and their applications. PIMS has established innovative programs which have had a transformative effect on mathematical research and training of students and postdoctoral fellows.

During 2012 PIMS helped to support over 100 scientific activities. These involved more than 5,500 attendees who spent nearly 18,000 attendee days at PIMS activities.

Conferences and Workshops: In 2012 there were over 3,300 participants at PIMS-supported conferences and workshops, including the Canadian Number Theory Association XII Meeting at ULethbridge, the Hot Topics Workshop on Computational Criminology at UBC and the PIMS Young Researchers Conference at UCalgary.

Summer Schools: PIMS hosted nine summer schools in 2012, including the PIMS-Mprime Summer School in Probability (featured in this issue) and the Mitacs/PIMS/SFU Summer School for Undergraduates in Algebraic Graph Theory.

Lecture and Seminar Series: PIMS supports a number of lecture series including the Hugh Morris and Marsden Memorial Lecture Series, the Computer Science Distinguished Lecture Series at UBC and the PIMS/UBC Distinguished Colloquium, featuring recent speakers such as Ben Green (Cambridge) and Emmanuel Candès (Stanford), as well as ongoing seminar series on topics such as algebraic geometry, math biology, topology and probability.

Industrial and Applied Activities: Events included the very successful IMA-Mprime-PIMS Mathematical Modeling in Industry Workshop for Graduate Students, which attracted 40 students, as well as industry representatives from Corning Incorporated, Siemens and CGGVeritas and more. The short course, Monte Carlo Methods for Quantitative Finance, examined how to use Monte Carlo methods for accurate option pricing, hedging and risk management and how to increase the efficiency of their applications.

Collaborative Research Groups: A record-setting total of six CRGs were sponsored by PIMS in 2012, on topics including non-commutative geometry, quantum information, number theory, applied harmonic analysis, networks and optimization.

Robert Lang, PIMS Public Lecture.

Hot Topics in Computational Criminology

Northwest Probability Seminar

Collaborative Research Groups

PIMS Collaborative Research Groups (CRGs) develop research and training networks, establishing lasting interdisciplinary links between geographically separate groups of researchers at member universities. Groups organize thematic activities, such as workshops, summer schools and seminars, make joint postdoctoral fellowship (PDF) appointments and develop joint graduate training programs. PIMS has developed 26 CRGs since its inception in areas ranging across all the mathematical sciences. These have served as catalysts for producing mathematical research of the highest quality in Western Canada and attracting outstanding faculty to PIMS universities.

PIMS had six CRGs operating in 2012: Applied and Computational Harmonic Analysis (2011-2014); L Functions and Number Theory (2010-2013); Mathematics of Quantum Information (2010-2013); Operator Algebras and Non-commutative Geometry (2009 - 2012); Optimization: Theory, Algorithms and Applications (2012-2015) and Algorithmic Theory of Networks (2012-2015).

Algorithmic Theory of Networks (2012-2015)

The technology revolution of the 1990s and 2000s owes much of its existence to the advances in computer networking technologies. These advances have made profound changes in how users and researchers model, construct/modify, maintain, use and ultimately view, networks in terms of scale, structure and functionality. Scientific and technical communities are faced with new networking paradigms which are complex, heterogeneous and data-intensive. The resulting theoretical and practical problems are multifaceted, requiring a wide range of expertise.

The group will organize a major event on Massive Scale Modeling and Algorithms for Networks at SFU Harbour Centre, as well as a workshop on Randomization in Networks at UVic, in addition to hosting a distinguished speaker series, postdoctoral fellows, summer schools and research visits.

This CRG brings together researchers from four major universities in Western Canada: Petra Berenbrink and Funda Ergun (SFU) and Valerie King (UVic) as the lead researchers, and Will Evans, Nick Harvey, and David Kirkpatrick (UBC), Bruce Kapron and Venkatesh Srinivasan (UVic) and Lisa Higham and Philipp Woelfel (UCalgary).

CRG Leaders

Funda Ergun
(SFU)

Petra Berenbrink
(SFU)

Valerie King
(UVic)

Optimization: Theory, Algorithms and Applications (2012–2015)

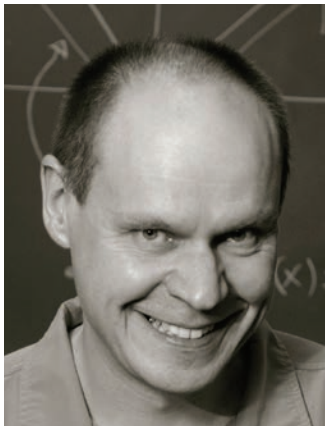
This CRG's goal is to facilitate the creation of new mathematics that ultimately supports better decision making by creating a truly collaborative and permanent network of optimizers in the Pacific Northwest. The collaborative network will allow the optimization community to organize and integrate itself, to enhance existing largely informal collaborations, to better identify new promising research projects and teams and to provide graduate students and postdoctoral fellows with rich and productive work environment and research experiences.

The group plans to hold a variety of scientific activities including the West Coast Optimization Meetings, a workshop on Robust Optimization, a conference on Geometric Aspects of Optimization, and Women Optimize in the West (WOW), a mentor-mentee international workshop. They will also host multiple distinguished visitors, as well as three postdoctoral fellows who are expected to spend time at two separate PIMS sites.

CRG Leaders

Yuriy Zinchenko
(UofC)

Michael Friedlander
(UBC)



Heinz Bauschke
(UBC-Okanagan)

Research Impacts: The Non-Commutative Geometry of Algebraic Integers.

In one of the main outcomes of CRG20, Operator Algebras and Non-Commutative Geometry, Joachim Cuntz, Christopher Deninger and Marcelo Laca associated Toeplitz-type C*-algebras to the rings of integers of algebraic number fields. In earlier work Cuntz and Li had produced purely infinite simple C*-algebras from rings of algebraic integers, and Laca and Raeburn had introduced a Toeplitz type C*-algebra for the natural numbers. The C*-algebras of [CDL] are simultaneous generalizations of the latter and extensions of the former; they have the right functorial properties, and thus the potential for generating invariants for number fields. Moreover, the natural noncommutative (quantum) dynamical systems based on the C*-algebras from [CDL] have equilibrium states exhibiting phase transitions that point to a connection with class field theory.

This work has already had a significant impact, sparking further research in several directions. One of the most interesting new directions is the study of C*-algebraic invariants for number fields that combine K-theory and ideal structure, appearing in subsequent work of Cuntz-Li, Li, and Echterhoff-Laca. The CRG fostered the generation of key ideas and attracted new researchers to the interface between operator algebras and number theory; the increased level of activity in this area prompted a focused workshop in Münster (December 2011), an Oberwolfach workshop in April 2012, and a BIRS workshop that will take place in 2013.

[CDL] J. CUNTZ, C. DENINGER, and M. LACA, *C*-algebras of Toeplitz type associated with algebraic number fields*, Math. Ann. (2012), DOI: 10.1007/s00208-012-0826-9.

[EL] S. ECHTERHOFF and M. LACA, *The primitive ideal space of the C*-algebra of the affine semigroup of algebraic integers*, Math. Proc. Cambridge Philos. Soc. (2012), DOI: 10.1007/s00208-012-0826-9.

International Graduate Training Centre in Mathematical Biology

2012 IGTC summit

The PIMS vision for creating the International Graduate Training Centres (IGTC) is to "Seize scientific leadership on the world stage and to launch a strategic training program in emerging areas in mathematics." This is to be achieved through training a generation of researchers in the application of new mathematics to present-day global problems. To these ends, PIMS created the IGTC in Mathematical Biology in 2007, which is directed by Prof. Dan Coombs of the University of British Columbia.

In 2012, the Centre continued in its mission to support graduate student education and skills training in mathematical and computational biology. An exciting development has been the financial support of Mprime, which allowed the recruitment of five additional new student fellows, thus extending the IGTC into 2014.

In May, Leah Edelstein-Keshet taught a summer course in Mathematical Cell Biology for graduate students. The course was taught live at UBC, but as a pilot web-based course, lectures and materials were shared online with the regional mathematical biology community.

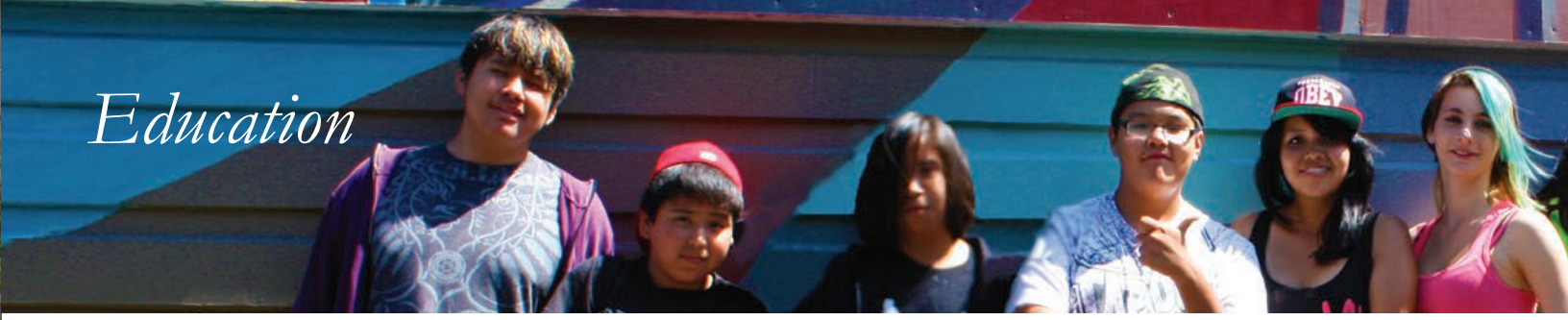
The annual IGTC summit was attended by nearly 40 students from UVic, UBC, UBC-O, SFU, UAlberta, Venezuela and Mexico. Special guest Prof. Steven Krone (UIdaho) gave an interactive workshop on biological modelling with interacting particle systems and a detailed research seminar on spatial pattern formation in bacteria-phage experimental systems.

A sample bag containing a juvenile pink salmon and sea louse. *Photo by Stan Proboszcz*

PIMS is proud to support IGTC student Stephanie Peacock (UAlberta)

"My interest is in host-parasite dynamics in wildlife populations and domesticated animals' impact on wildlife through disease transfer. I use mathematics to help understand interactions between farmed and wild salmon populations on the coast of British Columbia. A key aspect is connecting mechanistic models to data in order to answer applied questions. This connection has led me to collaborate with scientists from very different backgrounds. I learn from mathematicians, share data with government and industry partners, and work closely with salmon conservation biologists at eNGOs and other universities.

"As a student with a background in biology, I look forward to PIMS meetings and summits of the IGTC as opportunities to build collaborations with mathematicians. I have made valuable contacts with students and professors who I might not have otherwise met. The IGTC provides a forum for students in mathematical biology to meet, exchange ideas and generate new research avenues. I have thoroughly enjoyed my time in the program, and I look forward to participating as an alumni in future events!"



Education

An integral part of the PIMS mandate is to enrich public awareness of mathematics through outreach and to enhance mathematical training for teachers and students in K-12. PIMS is nurturing the pipeline of younger generations in Western Canada, including those with First Nations backgrounds. PIMS promotes numeracy as an integral part of development and learning. Some of the 2012 education activities included:

Math Mania

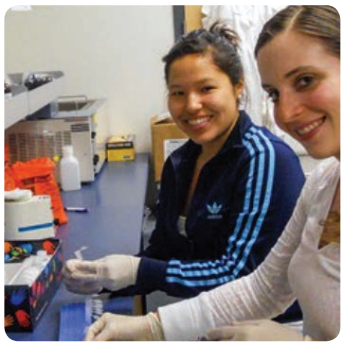
An event for elementary and middle schools in BC that presents a variety of interactive demonstrations, puzzles, games and art designed to demonstrate fun ways of learning math. 7 events were held with approximately 200 participants in 2012.

Elmacon

A yearly event for Grades 5 to 7 students from Lower Mainland BC and Victoria-area schools. ELMACON provides an opportunity to experience mathematics as an exciting sport. 275 students participated in 2012.

Math Central

3.5 million hits per month from approximately 250,000 visitors. Math Central attracts answer submissions from all over the world including Italy, Romania, Turkey and Indonesia.



Changing the Culture

A yearly one-day meeting that brings together mathematicians, mathematics educators and school teachers from all levels to improve teaching. 100 participants in 2012.

Aboriginal Scholarship Program

Since 2007 PIMS has collaborated to support scholarships for more than 57 Aboriginal students in the BC Lower Mainland.

Math on the Move

Visited 7 schools in 5 Saskatchewan school districts and delivered inquiry-based mathematics activities to 157 students. Support was provided by PIMS, the Faculties of Education and Science at URegina, and Math Central.

Postdoctoral Fellows

Every year PIMS sponsors numerous postdoctoral fellows (PDFs), attracting outstanding young scientists who contribute to PIMS research programs, many of whom later become faculty members at Canadian universities. PDFs are distributed throughout PIMS sites on a competitive basis. In addition, each CRG is allocated several PDFs, the selection of which is determined by an assessment panel. In 2012 PIMS supported a total of 45 PDFs at its sites.

2012 Incoming Postdocs:

Kun Wang (UAlberta)
Vladimir Zubov (UCalgary)
Benjamin Lundell (UWashington)
Xiaosheng Zhuang (UAlberta)
Ryan John Hamilton (UCalgary)
Nathan Krislock (UBC)
Yi Shen (UAlberta)
Andrew D. King (SFU)
Sara Madariaga (USask)
Emil Wiedemann (UBC)
Tong Zhang (UAlberta)
Matieu Huruguen (UBC)
Ohad Giladi (UA)

Featured Postdoctoral Fellow: Andrew King

"I completed my Ph.D. at McGill University in 2009 under the supervision of Bruce Reed, working on structural and algorithmic approaches to graph colouring. I spent the last year of my Ph.D. at ITI in Prague working with Daniel Kral, followed by two years as an NSERC Postdoctoral Fellow at Columbia University with Maria Chudnovsky. Throughout that time, much of my work was on the subject of claw-free graphs, particularly using structural decomposition to solve colouring and other problems efficiently. Another highlight was the proof of the Lovász-Plummer Conjecture on perfect matchings in cubic graphs.

"I have been at SFU for just over a year now, under the joint supervision of Pavol Hell and Bojan Mohar. Although my current research covers several problems, many of the threads surround the theme of sharpening our view of Reed's Conjecture on the chromatic number of a graph. A closer look at the fractional relaxation suggests that there is a hierarchy of local versions of the conjecture. Understanding this hierarchy properly may give insight into not only the nature of what the conjecture really means, but also how to approach it."

2012 Prizes & Awards

CRM - Fields - PIMS Prize
Stevo Todorcevic (University of Toronto)

The CRM-Fields-PIMS Prize is the premier Canadian award for research achievements in the mathematical sciences. Professor Todorcevic's contributions to set theory have made him a world leader in this topic. His work is recognized for its striking originality and technical brilliance. Among the most striking recent accomplishments of Todorcevic (and co-authors) are major contributions to the von Neumann and Maharam problems on Boolean algebras, the theory of non-separable Banach spaces, including the solution of an old problem of Davis and Johnson, the solution of a long standing problem of Laver, and the development of a duality theory relating finite Ramsey theory and topological dynamics. He currently holds a Canada Research Chair at the University of Toronto.

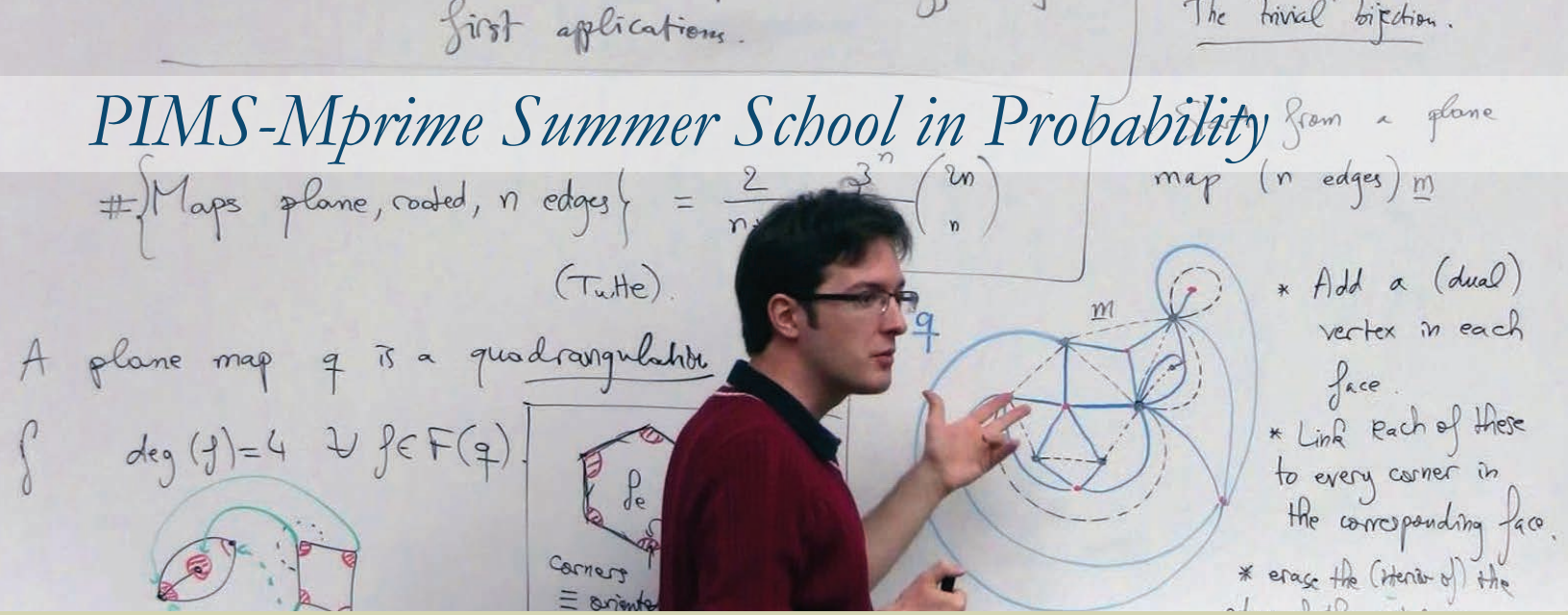
CAIMS/PIMS Early Career Award in Applied Mathematics
Theodore Kolokolnikov (Dalhousie University)

This award, which recognizes outstanding research in any branch of applied mathematics, was presented to Professor Kolokolnikov, for his highly influential contributions to the study of pattern formation in systems governed by nonlinear differential equations. A versatile researcher, he uses a wide range of mathematical techniques including asymptotic methods, PDE theory, complex analysis, dynamical systems, and scientific computation. He combines these tools in novel ways to derive precise, quantifiable predictions. His work is motivated by, and has wide applications to, the natural sciences, including such varied topics as models of laser fusion, patterns in chemical reactions, phytoplankton distribution in oceans, hot spots in microwave heating, models of crime, cell aggregation in chemotaxis and biological swarming.

PIMS Education Prize
Mark MacLean (University of British Columbia)

This prize recognizes individuals who have played a major role in encouraging activities that enhance public awareness and appreciation of mathematics. Dr. MacLean is making a major impact on teaching in Mathematics at UBC and beyond. He is an original member of the UBC Science One program and has contributed greatly to its success. In addition to his excellence in teaching, MacLean has taken leadership roles in course development, instructor supervision, tutorial centre management, and TA training. His energetic outreach activities include leadership in the Euclid Contest and teacher professional development in the area of Aboriginal Education. Special thanks to CGGVeritas: Hampson-Russell for sponsoring the 2012 PIMS Education Prize.

PIMS-Mprime Summer School in Probability

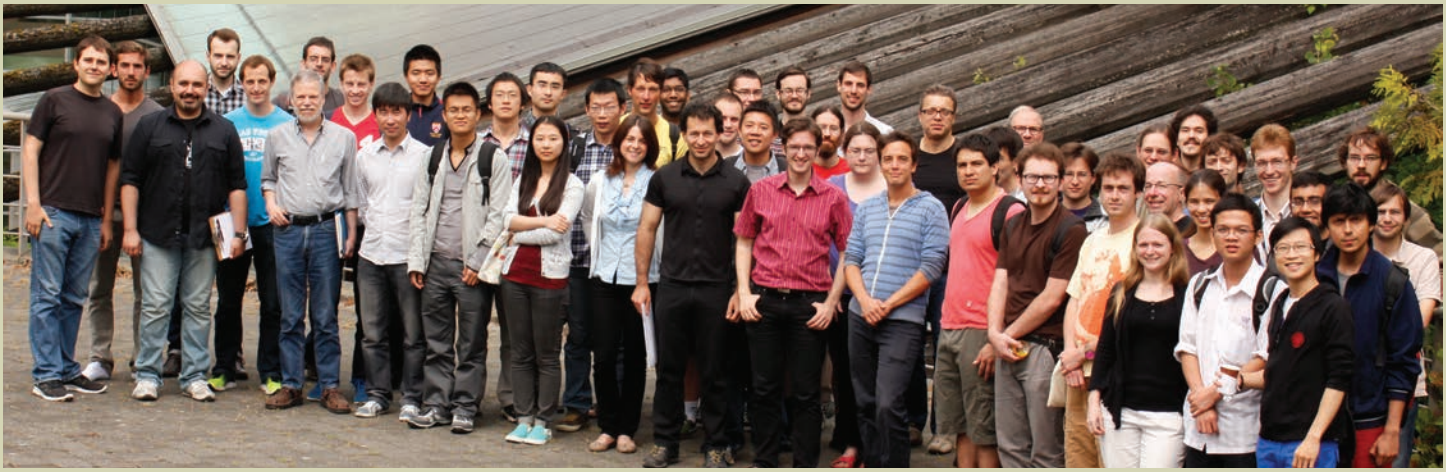


Grégory Miermont

Held in June, this major training event attracted over 80 registered participants from around the world. The Summer School was organized by Omer Angel, Ed Perkins, and Gordon Slade, and was supported financially by PIMS and Mprime as well as the UBC Department of Mathematics and the US National Science Foundation. Past PIMS Summer Schools in Probability have been held at UBC in 2004, 2005, 2008, 2009 (the latter joint with the Centre de Recherches Mathématiques), and at the University of Washington in 2010.

The format of the PIMS Summer School is unique, with a core consisting of two full-length courses, given by Omer Angel (UBC) and Grégory Miermont (CNRS-PIMS researcher), each comprising 24 hours of lectures. This was supplemented by 30 lectures given by Summer School participants themselves; for many, their first lecture in an international conference. The two courses were official UBC graduate courses and were taken for academic credit by UBC graduate students. Five keynote lectures were also given, by Alexander Holroyd (Microsoft), Rick Kenyon (Brown), Yuval Peres (Microsoft), Gordon Slade (UBC), and Bálint Virág (Toronto).

The organizers relied heavily on the Summer School's Scientific Panel, which consisted of Siva Athreya (Bangalore), María Emilia Caballero (Mexico City), Dayue Chen (Beijing), Zhen-Qing Chen (Seattle), Takashi Kumagai (Kyoto), Jean-François Le Gall (Orsay), Neal Madras (Toronto), and Vladas Sidoravicius (Rio de Janeiro). Panel members stimulated participation from young scientists in their part of the world, and advised the Local Organizers on which applicants merited funding. Their work was successful, as participants did attend from India, China, Japan, Israel, Poland, Germany, France, United Kingdom, Netherlands, Brazil, Mexico and of course, from the United States and Canada. The calibre of the attending students was very impressive. In particular, the large Probability Group at UBC benefitted greatly from all the activities of the Summer School, as did many students from the University of Washington.

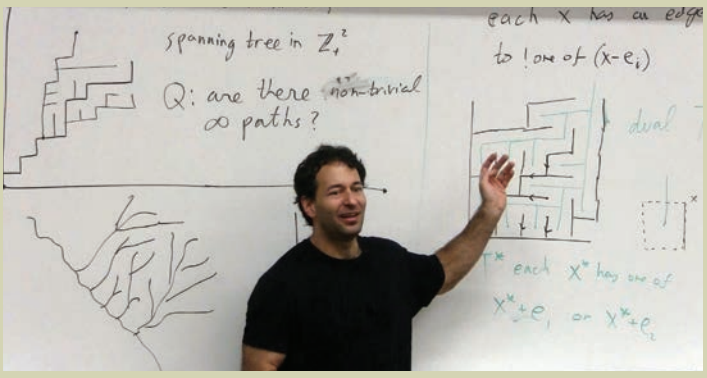


Summer school students continuing their discussions with Omer Angel on Leading Peak atop Anvil Island.

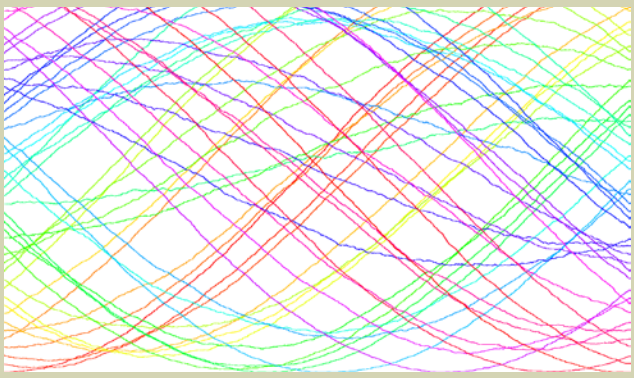
Omer Angel's course, *Interacting Particle Systems,* focused on the many incarnations of totally asymmetric exclusion processes, and included a presentation of his work with Holroyd, Romik and Virág on random sorting networks. This is a spectacular example of order coming from complete randomness and although fascinating results have been proved, they remain far away from capturing what the simulations are showing. The resulting conjectures are amazing. Take a randomly chosen sequence of $\binom{n}{2}$ nearest-neighbour swaps which take $1, \ldots, n$ to $n, \ldots, 1$. The rescaled trajectory of a randomly chosen particle will converge to a random sine curve (the amplitude and phase are random). The rescaled halfway permutation matrix (put a 1 in the i^{th} column at the location of the original i) will converge to the distribution on the disc obtained by projecting surface area on the 2-sphere S^2. The buzz in the room when these simulations were playing and the conjectures were being made was clearly audible. At the breaks Professor Angel was dealing with crowds of students wanting more.

Grégory Miermont's course on *Random Maps* focused on a major recent result on scaling limits of random maps that was announced in 2011 and obtained independently by different methods by Miermont and Le Gall. Take a randomly chosen graph with n vertices on the 2-sphere S^2 with each face bounded by q edges, e.g,. if $q = 3$, this is a triangulation. Equip the resulting graph with the graph distance and rescale by $n^{1/4}$. The resulting random metric spaces then converge in distribution as $n \to \infty$ (i.e., their random statistics converge) to a universal limiting metric space called the Brownian map. The result was the culmination of over ten years of work by many mathematicians, in a marvellous blend of combinatorics, geometry, and probability.

We look forward to the next PIMS Summer School in Probability, in June 2014 at PIMS-UBC's splendid new site.



Omer Angel



Simulations of the particle trajectories for the random sorting network-- clearly sine waves but all we know for sure is that they are Hölder continuous.

IMA/Mprime/PIMS Math Modeling in Industry

MMIW 2012 was held June 18-27 at the University of Calgary. Funding was provided by IMA, PIMS, Mprime, and NSERC.

The workshop brought industrial researchers, mathematicians and graduate students and postdoctoral fellows together in an intensive workshop devoted to the development and solution of mathematical models of pressing industrial problems. There were 40 students total – 19 from Canadian institutions, one from Mexico and the remainder from the USA.

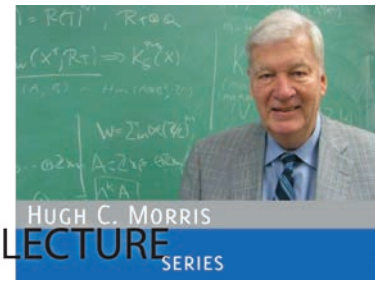
The workshop consisted of seven projects, with approximately six students per project. Further details on the projects and team members is available on the IMA website.

Notable outcomes of this event included an almost 100% level of participant satisfaction (measured by an exit survey) and a significant increase in students' interest in industry and industrial mathematics.

Project Titles:

- Touch Sensing, Silhouettes, and "Polygons-of-Uncertainty" (Corning Incorporated)
- Validation of Service Concepts for Oil Drilling by Simulation (Siemens)
- Azimuthal Elastic Inversion for Fracture Characterization (CGGVeritas)
- Identifying Sugars (National Institute of Standards and Technology)
- Multi-Objective Design of a Fuel Tank (Boeing)
- Interactive Treatment Planning in Cancer Radiotherapy (University of California, San Diego)
- Valuation of Over-the-Counter Derivatives with Collateralization (Royal Bank of Canada)

Hugh C. Morris Lecture Series



Hugh Morris (1932-2012)

In November the Hugh Morris lecture series moved to Calgary, where Henri Darmon (McGill University) delivered a beautiful lecture titled Numbers and Shapes. Attended by PIMS Director Alejandro Adem, PIMS Board Chairman Brian Russell and other members of the PIMS community including a strong contingent from the PIMS CRG on L-functions and Number Theory. Darmon's lecture ranged from some of the latest techniques in Diophantine analysis to sophisticated results in algebraic topology.

Darmon's lecture is available on mathtube.org.

This lecture series was made possible by an endowment from the late Dr. Hugh Morris, former Board Chair and longtime friend of the mathematical sciences.

2013 Event Highlights

EVENTS, CONFERENCES AND WORKSHOPS

17-19 January	**Disease Dynamics 2013: Immunization, a True Multi-scale Problem** University of British Columbia
3-4 May **2013**	**Prairie Discrete Mathematics Workshop** Thomson Rivers University
21-24 May	**PIMS Young Researchers Conference** University of Alberta
23-25 May	**International Workshop on Perspectives on High Dimensional Data Analysis** University of British Columbia
26-30 May	**CMOS/CGU/CWRA Joint Scientific Congress** University of Saskatchewan
3-7 June	**Automata Theory and Symbolic Dynamics** University of British Columbia
10-13 June	**CANADAM 2013** St. John's, Newfoundland
10-20 June	**Recent Advances in Hodge Theory: Period Domains, Agebraic Cycles, and Arithmetic** University of British Columbia
19-21 June	**Workshop on Curves and Applications** University of Calgary
24-28 June	**Pacific Rim Mathematical Association Congress** Shanghai Jiaotong University, China
25-28 June	**International Conference on Applied Cryptography and Network Security** Banff, Alberta
1-5 July	**Rolfsenfest - Low Dimensional Topology, Knots, and Orderable Groups** CIRM Luminy-Marseille
7-12 July	**Analysis and Partial Differential Equations** University of British Columbia
16-18 July	**Recent Developments in Numerical Methods for Seismic Inverse Problems and Applications** University of Calgary
22-26 July	**Recent Trends in Stochastic Analysis** University of British Columbia
24-26 July	**Complex Fluids and Flows in Industry and Nature II** University of British Columbia
29 July - 2 **August**	**Celestial, Molecular, and Atomic Dynamics** University of Victoria
5-9 August	**Mathematical Congress of the Americas** Guanajuato, Mexico
8-10 August	**Numerical Linear Algebra and Optimization** University of British Columbia
4-16 August	**Selected Areas in Cryptography** Simon Fraser University

MPE2013 COLLABORATIVE THEMATIC PROGRAMS

1 Jan - 30 Nov	**Models and Methods in Epidemiology, Ecology and Public Health**
1 Jan - 30 Sept	**Celestial Mechanics**

PUBLIC & DISTINGUISHED LECTURES

14 January	**Margot Gerritsen** University of British Columbia
7 February	**Gerda de Vries** University of Regina
15 February	**Béla Bollobás** University of British Columbia
8 March	**Avi Wigderson** University of British Columbia
5 April	**Jean-Pierre Bourguignon** University of British Columbia
27 May	**Yann Brennier** University of British Columbia
18 July	**Bruce Reed** Simon Fraser University

SUMMER SCHOOLS

27 May - 14 June	**PIMS IGTC Mathematical Biology Summer School** University of Alberta
17-21 June	**Canadian Summer School on Quantum Information** University of Calgary
25 June - 5 July	**Seminaire de Mathematiques Superieures** CRM - Université de Montréal

COLLABORATIVE RESEARCH GROUPS

2013 – 2016	**Geometry and Physics**
2012 - 2015	**Algorithmic Theory of Networks**
2012 - 2015	**Optimization: Theory, Algorithms and Applications**
2011 - 2014	**Applied and Computational Harmonic Analysis**
2010 - 2013	**Mathematics of Quantum Information**

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The PIMS-UBC site has moved to a new state-of-the-art facility.

Thank you to:

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