



PIMS MAGAZINE

Volume 12 - Issue 1 - June, 2009

DIRECTOR'S BLOG

Since its inception, PIMS has focused on promoting mathematics in many different ways. Excellent research is a

top priority, but its meaningful linkage to the training of future generations of mathematicians is highly important for us, whence events such as summer schools for graduate students are in abundant display at PIMS. Similarly our postdoctoral program plays a key role in attracting talent from all over the world to Canada. We also realize that the health of our profession depends on a robust pipeline of students with scientific training, and so PIMS has a profound interest in mathematical education and outreach. We also understand that the mathematical sciences must connect with society in meaningful ways, and we have pioneered activities in industrial mathematics in Canada, such as the Industrial Problem Solving Workshops.



Another unique feature about PIMS is the distributed nature of our institute: we currently have eight sites, located in Alberta, British Columbia, Saskatchewan and Washington State; our activities take place at these different locations, thus benefiting many people in geographically disparate areas.

PIMS has also developed many international connections. We are an UMI of the French CNRS; we have helped organized a network of mathematics institutes and departments in the Pacific Rim (PRIMA) which will be holding its first congress in Sydney this summer; we have collaborations with a number of mathematics institutes throughout North America. Most recently we signed a cooperative agreement with the IMA in Minneapolis, which will lead to increased exchanges in applied mathematics between Canada and the U.S. We have also signed an agreement with the prestigious RIMS in Kyoto, Japan and recently held a joint workshop with them.

Even though research and training are vital, it is also fundamental to have an adequate infrastructure for research. I am delighted to report that PIMS-UBC will be part of a new building on campus, which was recently announced by BC Premier Gordon Campbell. In this new location PIMS will be able to foster collaborations with colleagues in a variety of departments at UBC.

In this newsletter you will read about the numerous and varied activities taking place at PIMS; indeed this summer we will be hosting an unprecedented number of scientific activities connected to our thematic programs in PDE and Probability, as well as our brand new CRG in Operator Algebras and Non-commutative Geometry.

Finally I want to offer a few words of appreciation for the PIMS Board of Directors. They provide oversight and support for all of the activities at PIMS and play a crucial role in developing our strategy. In particular Hugh Morris, who has served on our Board for several years with great distinction, will be ending his term next month and I want to thank him for all his wonderful service to PIMS and Canadian mathematics.

Warmest regards,

Alejandro Adem
Director, PIMS

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PIMS CENTRAL SCORES NEW QUARTERS

On April 6, 2009 BC Premier Gordon Campbell announced major provincial funding for the UBC Earth Systems Science Building, a state-of-the-art education and research facility that will position UBC as a world leader in Earth-Science innovation. In addition, the building will be the new home of PIMS Central as well as the UBC Statistics Department.

This is a significant development for PIMS-UBC, as its new location will be in a modern facility at the heart of the UBC campus, surrounded by departments ideally suited for the interdisciplinary research spearheaded by PIMS. PIMS is grateful to the UBC administration for its support and to the BC government for funding this initiative.

For more details on this wonderful building please see <http://www.science.ubc.ca/news/259>. Construction is expected to commence in 2010 with completion scheduled for 2012.

PIMS AND IMA LAUNCH INTERNATIONAL PARTNERSHIP

The Institute for Mathematics and its Applications (IMA) launched its first major international partnership this month with a new agreement with PIMS. The agreement provides travel funds for faculty members at any IMA member institution to participate in programs offered by PIMS, and vice versa.



The new home for PIMS, expected to be completed in 2012

“This agreement makes a lot of sense because of the similar missions of IMA and PIMS. We hope that it will increase collaboration between mathematical scientists in Canada and the US, and lead to further future cooperation between the two institutes,” said Fadil Santosa, IMA Director.

The IMA was founded at the University of Minnesota in 1982 and fosters interdisciplinary research between mathematics, other sciences, and industry in order to find solutions to important scientific and technological problems. The IMA is funded primarily by the U.S. National Science Foundation.

INRIA SENDS DELEGATION TO PIMS

On December 16-18, 2008, a delegation headed by Dominique Sotteau, Director of International Affairs for l'Institut National de Recherche en Informatique et en Automatique (INRIA) visited PIMS sites at UBC, SFU and UVic. They met with researchers, postdoctoral fellows and administrators with the purpose of establishing active collaborations between INRIA and PIMS.

INRIA is a French national research institution focusing on computer science, control theory and applied mathematics. Created in 1967 at Rocquencourt near Paris, INRIA is a public scientific and technological establishment under the dual supervision of the French Ministry of National Education, Advanced Instruction and Research and the Ministry of Economy, Finance and Industry.



A NEW PARTNERSHIP WITH RIMS

To celebrate the start of a partnership between the Pacific Institute for the Mathematical Sciences and the Research Institute for Mathematical Sciences at Kyoto (PIMS and RIMS), a joint meeting entitled "**Random Processes and Systems**" was organized by Professor Takashi Kumagai in Kyoto, February 16 - 19, 2009.

PIMS looks forward with excitement to a new era of cooperation and exchanges with Kyoto.

PSU JOINS PIMS AS INTERNATIONAL AFFILIATE

In January 2008 PIMS welcomed the Department of Mathematics and Statistics at Portland State University as a new International Affiliate. The department, one of the first institutional sponsors of MSRI, has faculty in pure and applied math, statistics and mathematics education. It offers three M.S. programs and two Ph.D. programs. The Mathematics Education doctoral program is ranked 7th in the USA by Academic Analytics, and its Mathematical Sciences Ph.D. is recognized as a model of Ph.D. reform.

The PIMS contact at PSU will be Professor Marek Elzanowski, who is currently head of the department. PIMS is proud to have PSU join the PIMS family of supporting institutions and looks forward to many years of fruitful collaboration.

NEW CRG ON OPERATOR ALGEBRAS AND NON-COMMUTATIVE GEOMETRY

PIMS announces the formation of its 20th Collaborative Research Group, on **Operator Algebras and Non-commutative Geometry**, which will run 2009-2011.

The study of operator algebras was initiated by Francis Murray and John von Neumann in the first half of the last century, in response to the need for new models of mechanics on the atomic scale created by the advent of quantum physics. Classical mechanics, appropriate for macroscopic phenomena, is modeled by a pair of objects: phase space, which is essentially geometric, and the observables, which form a (commutative) algebra of functions defined on phase space. In contrast, at the heart of quantum physics lies the Heisenberg uncertainty principle, which translates into the failure of commutativity of the multiplication of observables, so the phase space model of classical mechanics does not carry over to the quantum regime. Since the composition of operators is non-commutative, they are natural candidates to model the observables.

The main idea of Alain Connes' program of non-commutative geometry stems from the observation that the geometry of classical phase space may be described indirectly in terms of the commutative algebra of functions on this space. These algebras have a natural non-commutative generalization in the algebras of operators on Hilbert space, and accordingly, the properties of algebras of operators may then be viewed as describing a "non-commutative geometry" which is remarkably suited to describe quantum phenomena. In the last thirty years or so, this philosophy has led this branch of mathematics to grow in a spectacular way, and to develop deep interactions with other branches of mathematics, such as geometry, topology, number theory and dynamical systems.

The Canadian operator algebra community is internationally recognized for its strength and size. In recent years substantial groups of researchers have established themselves in the west, and the Collaborative Research Group grant from PIMS will help promote the activities of these researchers. One of its goals is to establish Western Canada as a world leader in research and training in this area.

In addition to inviting distinguished speakers and hiring and training postdocs, the CRG-planned activities include two editions of the **Canadian Operator Symposium** (Regina 2009 and Victoria 2011), two editions of the **Northwest Functional Analysis Symposium** (BIRS 2009 and 2011), several focused minicourses, workshops, and conferences on topics such as **KMS States and Non-commutative Geometry** (Victoria 2009), **Operator Algebras and Non-commutative Geometry** (Victoria 2010), **Non-commutative Dynamics and Quantum Probability** (Regina 2010), **Analysis of Group Algebras** (BIRS 2011), and **Topological Dynamics and C*-algebras** (Victoria 2011).

The operator algebra group within PIMS includes researchers at the universities of Victoria, Regina, Calgary and Alberta and is representative of the diversity of the subject; it is at the forefront of research in index theory related to deep properties of the new geometry; in the interplay between physics and number theory; and in the study of dynamical systems. The CRG will be led by Douglas Farenick (University of Regina), Marcelo Laca and Ian Putnam (University of Victoria) and Anthony Lau (University of Alberta).

PIMS ANNOUNCES 2009-2010 POSTDOCTORAL FELLOWSHIPS

The PIMS community owes a debt of gratitude to the PIMS postdoctoral committee, which donated many hours of work in order to select from the pool of very strong applicants the following individuals:

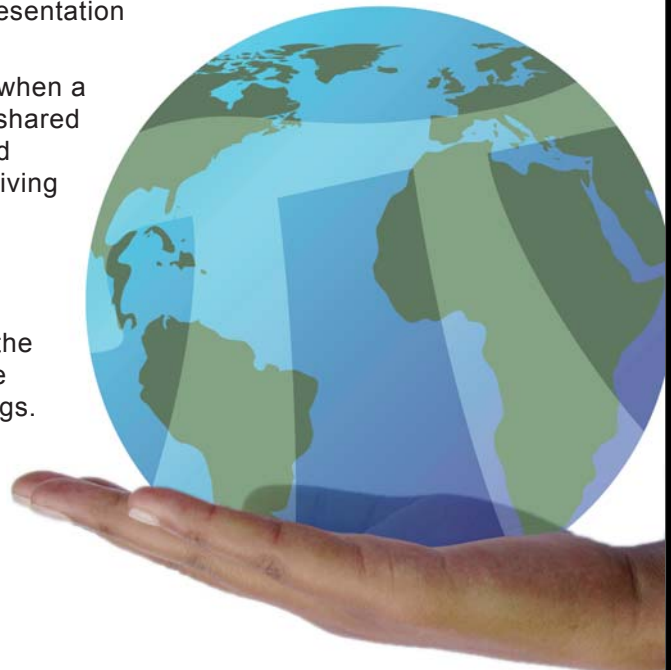
NAME	FIELD	SPONSOR
Guillaume Chapuy	Combinatorics	Bojan Mohar (SFU)
Thomas Michael Sauerwald	Computer Science (Probability Theory and Stochastic Processes)	Petra Berenbrink (SFU)
Hari Krishna Kunduri	Relativity and Gravitational Theory	Don N. Page (UA)
Benjamin Fortescue	Quantum Information Theory	Gilad Gour (UC)
Robert Francis Bailey	Combinatorics	Karen Meagher (UR)
Marina Tvalavadze	Nonassociative Rings and Algebras	Murray Bremner (USask)
Bogdan Nica	Operator Algebras and Non-Commutative Geometry - CRG 20	Heath Emerson (UVic)
Tsuyoshi Yoneda	Navier-Stokes Equations, Geophysics	Slim Ibrahim (UVic)

This year, for the first time, PIMS asked all applicants to apply for postdoctoral positions on MathJobs. The process went smoothly and efficiently, and PIMS will continue to use this service for future competitions.

PIMS AUGMENTS POSTDOC PROGRAM

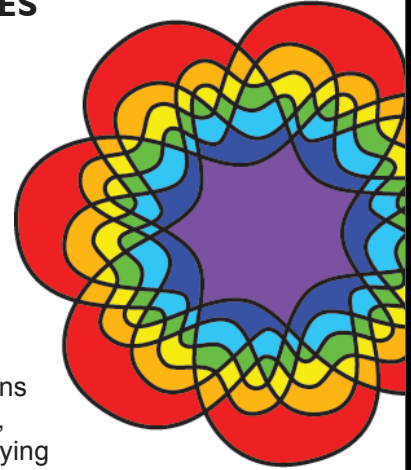
PIMS Central has instituted a program aimed at enhancing the mentoring of PIMS Postdoctoral Fellows at UBC. Spearheading the program is the **PIMS Postdoctoral Colloquium Series**, which gives postdocs the opportunity to present their research to their peers in low-stress colloquia. The goals are to hone both their job presentation and public speaking skills.

In October, there was the **PIMS Postdoc Day**, when a number of established research mathematicians shared tips about the professional lives of academics and industrial scientists, as well as strategies for surviving job interviews. As a follow-up to this, there was a “grantsmanship class” in the spring semester to learn about funding opportunities in Canada and the United States and to develop all-important grant application prowess. Other components of the program are more social in character, and include bonspiels, beer seminars, and other shared outings.



PIMS EDUCATIONAL OUTREACH ACTIVITIES

- The PIMS UBC Education Team, consisting of Melania Alvarez and Rahael Jalan, has been involved in numerous activities, including the **Britannia Math Initiative** and **Making Math Meaningful** programs in Metro Vancouver schools. The **PIMS Summer Math Camps** for aboriginal students making the transition to high school will be offered again in 2009. Well-received workshops on **Successful Strategies for Teaching and Learning Mathematics** have also been offered at local schools. PIMS also partnered with the UBC Math Department to offer workshops at several Vancouver schools.



- The University of Victoria is providing opportunities for local First Nations school students (grades 1 - 12) to engage in hands-on STEM (Science, Technology, Engineering and Math) activities. PIMS' **Math Mania** is playing a key role in this program. On February 10, 2009, PIMS UVic Education Coordinator David Leeming visited the grade 5-6 class at the ŁÁU,WELNEW Tribal School at Brentwood Bay, BC to present selected Math Mania activities. STEM also hosted Aboriginal Youth Tours on the UVic campus for 116 students in February; Math Mania was among the featured events. One grade six student commented, "Math Mania ... has math in it which I LOVE."

- PIMS at the University of Calgary has been an important supporter of the **Calgary Science Fair**. This year's top prize at the Calgary Math and Science Fair was presented by the PIMS Education Coordinator Eva Nosal to Mark Bezdek for his project "Floodlight Illumination."

- **The 2009 Canadian Mathematics Education Forum (CMEF 2009)** was held April 30 to May 3, 2009, at SFU Vancouver. The 2009 Forum was organized and cosponsored by the Canadian Mathematical Society (CMS) and PIMS. Its main purpose was to maintain lines of communication between school teachers, university/college mathematicians and math educators, and to foster significant encounters between all major players in mathematics education, including government, publishers and parents. We

would like to acknowledge the main organizers Malgorzata Dubiel (Dept. of Mathematics, Simon Fraser University), Viktor Freiman (Université de Moncton), and Peter Taylor (Dept. of Mathematics & Statistics, Queen's University) for all their efforts in making this event a success.



*PIMS Education Coordinator,
Eva Nosal and
Prizewinner Mark Bezdek*



The PIMS Summer Math Camp will be offered once again in 2009

- This year's **Changing the Culture** was a satellite conference of The Canadian Mathematics Education Forum, and several of the participants from other parts of Canada were able to attend as well.

f (unctions)

PIMS WINTER EVENTS 2008/2009

The **Women in Numbers Workshop** provided a unique effort to help raise the profile of active female researchers in number theory and increase their participation in research activities in the field. 41 female number theorists—faculty at all ranks, postdocs and graduate students from across Canada and the U.S.—were invited to participate in the workshop, which was held at the Banff International Research Station in November. They gave talks, exchanged ideas, and conducted collaborative research in 8 groups of 4-6 members each. The research topics ranged from algebraic, analytic and algorithmic number theory to cryptography. In addition to PIMS, this event was co-sponsored by the Fields Institute, the University of Calgary, Microsoft Research, the U.S. National Security Agency and BIRS.



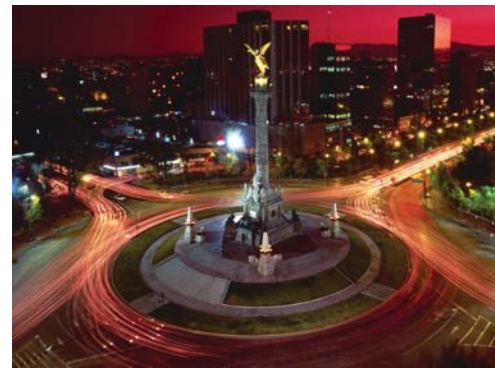
The Women in Numbers Workshop at Banff, Alberta

In November John D. Kalbfleisch, Professor of Statistics & Biostatistics at the University of Michigan, presented a **PIMS Distinguished Lecture** on “Statistical Analysis of Illness Death and Semi-competing Risk Data” at UBC. In the same vein, PIMS sponsored a December workshop on **Recent Advances in Modeling Biological Processes**, held at the Fred Hutchinson Cancer Research Center in Seattle. This conference was a component of PIMS’ Collaborative Research Group (CRG) on Bayesian Modeling and Computation for Networks.

PIMS is branching out! Several PIMS-supported events were held in far-flung locations recently. First there were the **International Workshop & Conference on Cluster Algebras and Related Topics**, which took place in Morelia & México City, México, respectively, during December.

These were followed by the **Interdisciplinary Workshop on the Effects of Climate Change: Coastal Systems, Policy Implications, and the Role of Statistics**, held in Sliema, Malta this March. The themes for the workshop were facts and uncertainties of climate change and its effects on coastal systems and marine safety, and the use of modern statistical tools to address some of these important issues. The workshop was preceded by an **Intensive Course for Young Researchers on Statistical Software for Climate Research**. These events were part of the PIMS Collaborative Research Group (CRG) on Environmetrics.

The study of infinite dimensional dynamical systems has been among major sources of motivation and applications of development in nonlinear analysis and other mathematical fields. Such systems have also found more and more important applications in physical and life sciences. The PIMS-supported **International Conference on Infinite Dimensional Dynamical Systems**, held at York University in September, covered a wide range of topics and addressed the common features and distinctions in those systems generated by various types of differential equations. This conference was also dedicated to Professor George Sell from the University of Minnesota on the occasion of his 70th birthday, who delivered a public lecture, “An Evolution in Evolutionary Equations.”



Mexico City bustling through the night

f (unctions)

Closer to home, UBC-Okanagan hosted the **West Coast Optimization Meeting** in September. The Fall 2008 meeting was held in particular in honor of Stephen Simons' 70th birthday. Because of the happy and special occasion, it drew a stunning selection of world-class researchers from around the globe to Kelowna. This was the second time that the meeting has been held in Kelowna; UBC-O Mathematics has a small graduate program, so exposure to conferences such as this is essential to the education and success of its graduate students.



*Kelowna, BC:
Home of UBC Okanagan*

In December the University of Calgary celebrated a **Conference in Honour of Robert Woodrow's 60th Birthday**, focusing on combinatorics and graph theory. A blend of presentations was given to postdoctoral fellows by long standing experts in these areas, triggering discussions, new ideas, and stimulating collaborations. Graduate students were also present to stir their research interests.

Graduate students seized the day at the **Applied Math Graduate Student Conference** at Simon Fraser University — literally! The AMGSC 2009 was a one-day conference in January organized exclusively for and by graduate students. The intent was to give students an opportunity to network and present their research in a relaxed environment. This year's meeting brought together 33 students from 9 institutions in the U.S. and Canada.



*Graduate students at
The Applied Math Graduate
Student Conference*

Other events during autumn and winter included:

- **Second Graduate Research Summit of the International Graduate Training Centre in Mathematical Biology**, Banff, September 19-21, 2008
- **7th & 8th Pacific Northwest PDE Meetings**, University of Victoria and University of British Columbia, September 2008 and January 2009
- **American Mathematical Society 2008 Fall Western Section Meeting**, University of British Columbia, October 4-5, 2008
- **Is there an Internal Wave Continuum in the Ocean?** University of Washington, October 3-4, 2008
- **The Tenth Northwest Probability Seminar**, Microsoft Research, Redmond, WA, November 8, 2008

Spring 2009 activities consisted of the **Sixth Combinatorics Day**, held at the University of Lethbridge in March, and the **ABC Algebra Workshop** and **Alberta Number Theory Day II**, both taking place at the University of Calgary in April. Slightly farther afield was the **Third Annual Meeting of the Prairie Network for Research in Mathematical Sciences and Student Workshop**, University of Saskatchewan that convened at the end of April. **The Cascade Topology Seminar** took place at UBC, also in April, and featured lectures by Gang Tian (Princeton) and Ron Stern (UC Irvine).



SUMMER 2009 THEMATIC PROGRAM: CHALLENGES AND PERSPECTIVES IN PROBABILITY

Probability theory is flourishing globally, with respect both to its own development as a mathematical discipline and its applications to other areas of mathematics and science. To highlight this the CRM and PIMS are jointly sponsoring, with support from MITACS, a joint thematic program, Challenges and Perspectives in Probability, which highlights applications of interest in physics, in biology, in computer science and in combinatorics and which is linked to the previous CRM program Probabilistic Methods in Mathematical Physics .

Perspectives in Probability consists of two workshops in Montreal, two workshops in Vancouver, a summer school in Vancouver, the Aisenstadt Chair Svante Janson, the PIMS Distinguished Chair Don Dawson and an enhanced postdoctoral program in probability with most of the activity in the coming Summer. Taken altogether these events will showcase the give-and-take of probability theory in areas such as the analysis of algorithms and cellular automata, diffusion in random media, interacting particle systems and their properties in the large captured in hydrodynamic limits, theoretical physics and the renormalisation group. An allied 5-day BIRS workshop will focus on the ever increasing importance of probabilistic models in molecular biology and genetics. Some of these topics will be featured in the Summer School.

For more information, see:

www.pims.math.ca/scientific/thematic-programs/challenges-and-perspectives-probability

SUMMER 2009 THEMATIC PROGRAM: PARTIAL DIFFERENTIAL EQUATIONS

Partial Differential Equations is a large subject with a history that dates back to Newton and Leibniz. They form the basis for many mathematical models in the sciences and in economics, yielding such famous equations as the Euler and Navier Stokes equations and Schrödinger's and Einstein's equations. Moreover the subject is far more than just a mathematical tool to address physical and economic phenomena; PDE's have guided and created the fields of nonlinear functional analysis, harmonic analysis, optimization and the modern calculus of variations, and have had a major impact on the field of geometry. The latter, was recently highlighted by the role of Ricci flow in the eventual proof of the celebrated Poincaré conjecture.

The core of the thematic program will be the following six workshops at UBC and UVic. Two related workshops have already been approved to run at the Banff International Research Station (BIRS) during that period. A summer school with 12 mini-courses will be run in conjunction with the program: each workshop will have at least 2 mini-courses given by experts and which will be directed towards advanced graduate students and postdoctoral fellows. This program is partially supported by MITACS through Accelerate Canada and by the US National Science Foundation.

For more information, see:

www.pims.math.ca/scientific/thematic-programs/pde

Here's Lookin' at Euclid!

PIMS EDUCATION PRIZE AWARDED TO GERDA DE VRIES

The Pacific Institute for the Mathematical Sciences (PIMS) is delighted to inform the mathematical community that the winner of the 2009 PIMS Education Prize is Gerda de Vries 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.

Gerda de Vries is an outstanding and dynamic teacher who has made remarkable contributions to education in the mathematical sciences. Her accomplishments include her tireless promotion of education in math biology as an organizer of the **PIMS Math Biology Undergraduate Summer Workshops**; her leadership role in the NSERC funded CRYSTAL-Alberta for promoting science in schools; her leadership role in providing support for women in mathematics across Canada; her involvement in developing Science 100, a new interdisciplinary science program at the University of Alberta; and her outstanding success teaching undergraduate mathematics, for which she received the 2006 Rutherford Award for Excellence in Undergraduate Teaching at the University of Alberta.

The 2009 PIMS Education Prize was awarded at a special event during the **2009 Changing the Culture** conference at SFU Vancouver on April 30. PIMS is grateful to CGG Veritas/Hampson Russell for sponsoring this award.



Gerda de Vries, winner of the 2009 PIMS Education Prize with Alejandro Adem, Director of PIMS

BILL SANDS WINS CMS GRAHAM WRIGHT AWARD FOR DISTINGUISHED SERVICE



CMS Graham Wright Award Winner, Dr. Bill Sands

Bill Sands (U of C), organizer of the PIMS-funded Alberta High School Math and the Tournament of Towns Contests, has won the Canadian Mathematical Society's 2008 Graham Wright Award for Distinguished Service.

Along with his work administrating math contests, Dr. Sands helped guide and nurture the CMS's International Mathematical Olympiad (IMO) program, a world championship of high school mathematics competitions. He chaired the IMO Committee from 1998 to 2008, training the majority of Canada's "Mathletes." In 2007, he led the Canadian Delegation to the 48th IMO in Hanoi, Vietnam where Canada finished 27 out of 93 countries. Dr. Sands joined the Department of Mathematics and Statistics at the University of Calgary in 1979. He conducts research in combinatorial mathematics, studying graph theory and partial orderings.



Here's Lookin' at Euclid!



*Dr. Gunther Uhlmann
Fellow of the American Academy of
Arts & Sciences*

GUNTHER UHLMANN ELECTED TO THE AMERICAN ACADEMY OF ARTS & SCIENCES

In April 2009, PIMS UW Site Director Gunther Uhlmann was elected Fellow of the American Academy of Arts & Sciences alongside 210 other leaders in the sciences, humanities, arts, business and public affairs. Uhlmann works on inverse problems, in which one attempts to determine the internal parameters of a medium by making measurements at the boundary or at the exterior of the medium. Another recent area of his interest has been cloaking, which deals with the question of how to make objects invisible to electromagnetic waves, sound waves and other types of waves; an overview of this work can be found at the Society for Industrial and Applied Mathematics website.

For a full list of 2009 fellows, see: www.amacad.org/news/new2009.aspx

PETER LANCASTER & BOB RUSSELL NAMED SIAM FELLOWS

Congratulations go out to PIMS scientists Peter Lancaster (U of C) & Bob Russell (SFU) for being named to the inaugural class of Fellows of the Society for Industrial and Applied Mathematics (SIAM). Fellowship is an honorific designation conferred on members distinguished for their outstanding contributions to applied mathematics and computational science. Prof. Lancaster was cited for his contributions to matrix analysis and its applications to vibrations, systems theory and control, and Prof. Russell for his contributions to the numerical solution of ordinary and partial differential equations.

Further information can be found at: www.siam.org/prizes/fellows/

CRM-FIELDS-PIMS PRIZE CALL FOR NOMINATIONS

PIMS is now calling for nominations for the 2010 prize. The nominee's research should have been conducted primarily in Canada or in affiliation with a Canadian university. The main selection criterion is outstanding contribution to the advancement of research. Nominations are due November 1, 2009, and should be sent to director@pims.math.ca.

The CRM-Fields-PIMS prize is one of the premier mathematics prizes in Canada. The winner receives a monetary award, and an invitation to present a lecture at each institute during the semester when the award is announced.

For details, please see: www.pims.math.ca/about-us/prizes/-/awards

**SECOND JOINT MEETING OF THE
CANADIAN AND MEXICAN
MATHEMATICAL SOCIETIES**

CMS-SMM-2009



AUGUST 13 - 15, 2009

UNIVERSITY OF BRITISH COLUMBIA, VANCOUVER CANADA

WWW.MATH.CA/EVENTS/CMS-SMM-2009

SMC-SMM-2009



1st PRIMA Congress

July 6 - 10, 2009

University of New South Wales, Sydney, Australia

www.primath.org/prima2009