



Pacific Institute for the Mathematical Sciences

Alejandro Adem PIMS Deputy Director



Alejandro Adem

PIMS is pleased to announce the appointment of Alejandro Adem as PIMS Deputy Director effective January 1, 2005. Until then Manfred Trummer will continue as Deputy Director.

Professor Adem is a very distinguished topologist who has made important contributions to the study of group actions and to the cohomology of finite groups. He received his Ph.D. from Princeton University in 1986. He was the Szegő Assistant Professor at Stanford University (1986–89) and a member of the Institute for Advanced Study (1989–90) before moving to the University of Wisconsin-Madison.

He has held visiting positions at MSRI (1990), ETH Zurich (1993–94), Max Planck Institut Bonn (1997–98), University of Paris VII (1998), CRM Barcelona (1998), University of Paris XIII (2000), and Hong Kong University of Science and Technology (2001).

See New Deputy Director on page 3

VIGRE Award to the University of Washington

Contributed by Gunther Uhlmann, PIMS-UW Site Director

The University of Washington (UW) has been awarded a five-year grant totaling US\$3.9M by the National Science Foundation (NSF) under the VIGRE program of the NSF Division of Mathematical Sciences.

See VIGRE on page 4

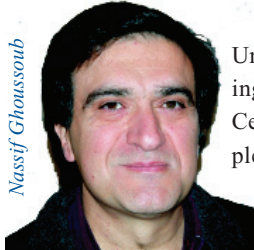
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Long Arithmetic Progressions of Primes
Ben Green on page 10

New BIRS Scientific Director Appointed

The Board of Directors of the Pacific Institute for the Mathematical Sciences (PIMS), and the Board of Trustees, Mathematical Science Research Institute (MSRI), are happy to announce the appointment of Dr Nassif Ghoussoub as Scientific Director of the Banff International Research Station (BIRS) for a period of 3 years starting January 1, 2004. Dr Ghoussoub replaces Dr Robert Moody who has led BIRS through its difficult initial stages.



Nassif Ghoussoub

Dr Ghoussoub is presently Professor of Mathematics and “Distinguished University Scholar” at the University of British Columbia. He is the founding Director of PIMS (1996–2003), a co-founder of MITACS (Network of Centres of Excellence in Mathematics of Information Technology & Complex Systems) and a member of its Board of Directors for the period 1998–2003. He is also a co-founder of BIRS and was Chair of its executive committee for the period 2000–2003.

See New BIRS Scientific Director on page 5



The scenic photographs in this magazine showcase some of the exceptionally beautiful surroundings of the various PIMS sites

*Writing-on-Stone Provincial Park, near Milk River, Southern Alberta
 Photo Courtesy of Travel Alberta*

Director's Notes



Ivar Ekeland, PIMS Director

What do we have to show for the 2003-04 academic year? First and foremost, the science, of course. Since April 2004, we have seven PIMS Collaborative Research Groups simultaneously working in periods of concentration, and 26 post-doctoral fellows at the PIMS universities. This has been generating a lot of scientific activity at the PIMS sites, and it has also been attracting a lot of attention. Several prominent research institutes in mathematics around the world are inquiring about the possibility of associating themselves with PIMS.

While Ben Green was a post-doctoral fellow at PIMS, he and Terry Tao have obtained a remarkable result on prime numbers (see Green's article in this newsletter). This is a testimony to the quality of the research at PIMS, and the excellent post-doctoral fellows we are getting.

We must continue to work hard to keep the momentum, and put every effort into quality to make PIMS a leading research institute in the world. To do this, we will be helped by the success of the Banff International Research Station, which is now almost through its second year of operations. BIRS is a huge success, and all the PIMS universities are benefiting from

its prestige and the fact that BIRS is attracting many excellent mathematical scientists to the Canadian West. Again, we must work hard to build up and maintain the reputation of BIRS. This will be done by being uncompromising on quality, by being proactive in seeking out promising developments of mathematics, and by improving the research conditions at the Banff Center (for instance, by developing on-line library resources). We are fortunate to have Nassif Ghoussoub as a Scientific Director of BIRS, who will impart his energy and vision to that task.

It is also very good news for us that federal funding for MITACS has been renewed for a second seven-year period. This will certainly be of help to PIMS in our own efforts to develop industrial projects. We all know how important it is, for our research and for our students, to have good industrial contacts, and how difficult and time-consuming it is to establish and maintain them. PIMS has succeeded in doing so, as the GIMMC and the IPSW have demonstrated every year, but at a huge cost in time and effort. We are confident that MITACS will help us overcome that barrier, and assist us in exploring new directions. The appointment of Gary Margrave as PIMS Industrial Facilitator fits into that strategy.

Other good news comes from the South. The University of Washington, which has worked with us informally but closely for several years, has recently been awarded a prestigious

VIGRE grant (see this newsletter), and closer cooperation with PIMS was a key element in the grant application.

PIMS had another very busy summer with numerous conferences, workshops and summer schools. Special thanks go to the organisers of these events, and to the staff at all PIMS sites for their invaluable support. I would also like to mention the many educational events that have taken place during the year. PIMS personnel have put an extraordinary amount of enthusiasm and energy into organising these events, and they are indeed an important component of our mission. I am also pleased to announce that PIMS is making a special effort towards the First Nations, and that we will be represented at the upcoming Provincial Conference on Aboriginal Education.

Since June, scientists at PIMS-UBC have taken advantage of the newly added space at our Central Office. I wish to thank UBC for doubling the space available to PIMS. For those of you who know the PIMS site at UBC, we now have expanded into the first floor, and we have an interior staircase joining the first and second level, in the best mathematical tradition. We also have a new lecture/meeting room, and a small library. During the building period, there was some disruption, as you may easily guess and as the pictures illustrate.

I hope you enjoy this newsletter. Many thanks to Heather, Stefanie and Manfred for putting it together.



PIMS-UBC Site Renovations: The new lecture room (left), and the interior staircase (right).

Call for Scientific Proposals in the Mathematical Sciences

PIMS now welcomes applications for support for conferences, workshops, seminars and related activities in the Mathematical Sciences, to occur after April 1, 2005. PIMS also invites scientists of PIMS universities to submit letters of intent for a period of concentration of a PIMS Collaborative Research Group.

The deadline for applications is October 15, 2004. The results will be announced by January 31, 2005.

For more information please see: <http://www.pims.math.ca/opportunities/proposals.html>.



Personnel Changes at PIMS

In addition to the appointment of Alejandro Adem as Deputy Director, PIMS is pleased to announce the following:

New Board of Directors

The five founding universities have appointed representatives as follows:

- Bruce P. Clayman, VP Research, SFU
- Gary Kachanoski, VP Research, U of A
- Donald E. Brooks, Associate VP Research, UBC
- Michael Boorman, Dean of Science, U of C
- Martin Taylor, VP Research, UVic

In accordance with the member universities' agreement about PIMS, the university representatives, together with the PIMS director, have invited three mathematical scientists from the PIMS community to join the renewed Board of Directors:

- Mark Lewis, Math and Stat Sciences, U of A
- Edwin A. Perkins, Mathematics, UBC
- Hugh C. Williams, Math and Stat, U of C

The following four people have been appointed from the industrial sector:

- Hugh Morris, President and CEO, Padre Resource Management, Delta (former Chair of the PIMS Board)
- Brian Russell, VP, Veritas DGC Inc, Calgary
- Don Denney, Manager of Process Automation, Syncrude Canada Ltd, Edmonton
- Haig Farris, President, Fractal Capital Corp.

Michael Boorman is the new Chair of the PIMS Board of Directors.

To read the biographies of the board members please go to <http://www.pims.math.ca/personnel/directors.html>.

New Site Directors

Gemai Chen became the new PIMS Site Director at the University of Calgary on June 1, 2004. He took over from Gary Margrave.

Christopher Bose began his term as University of Victoria PIMS Site Director on July 1, 2004. He took over from David Leeming.



Gemai Chen



Christopher Bose



Gerald Cliff

Gerald Cliff is the new PIMS Site Director at the University of Alberta. His term began August 2004. Prior to that Bryant Moodie was Acting Site Director.

Manfred Trummer and Gunther Uhlmann continue as Site Directors

at SFU and UW, respectively.

Please see http://www.pims.math.ca/whatsnew/new_site_directors.html.

PIMS Industrial Coordinator

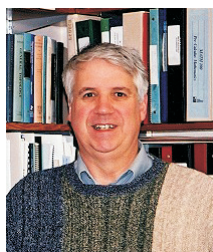
Gary Margrave is now the PIMS Industrial Coordinator. This is a new position designed to expand PIMS activities in the industrial sector.



Gary Margrave

PIMS Education Coordinator in BC

Melania Alvarez-Adem will be the new Education Coordinator in BC, starting January 1, 2005. Her role will complement that of Klaus Hoechsmann, PIMS Education Facilitator, giving a boost to PIMS education activities in BC.



David Leeming

Pi in the Sky Managing Editor

David Leeming is now the Managing Editor of Pi in the Sky magazine. For the full list of Editorial Board Members see page 14. David is also active in various PIMS education initiatives.

For the full announcement about the three new positions listed above please see http://www.pims.math.ca/whatsnew/new_others.html.

Administrative Changes

On February 1, 2004 Shelley Alvarado was appointed Chief Operations Officer. Andrea Hook has left PIMS to pursue a career in teaching. Fanny Lui is the new PIMS Administrator.



Andrea Hook at her farewell reception

PIMS Scientists Receive Honours

The Canadian Mathematical Society (CMS) has selected Joel Feldman (UBC) as the winner of the 2004 Jeffery-Williams Prize and Jingyi Chen (UBC) as the winner of the 2003 Coxeter-James Prize.

The Jeffery-Williams Prize recognizes mathematicians who have made outstanding contributions to mathematical research. Joel Feldman gave the 2004 Jeffery-Williams Prize Lecture at the CMS Summer Meeting, hosted by Dalhousie University, in June 2004.

The Coxeter-James Prize recognizes young mathematicians who have made outstanding contributions to mathematical research. Jingyi Chen presented the 2003 Coxeter-James Prize Lecture at the CMS Winter Meeting, hosted by SFU, in December 2003.

The two joint winners of the CRM-Fields prize for mathematics for 2002–2003 were John McKay (Concordia) and Edwin Perkins (UBC). The prize, awarded annually by the Centre de Recherches Mathématiques in Montreal and the Fields Institute in Toronto recognises exceptional contributions by a mathematician working in Canada. Ed Perkins is a member of the PIMS Board of Directors.

Nassif Ghoussoub received an Honorary Doctorate from the University of Paris IX in June of this year. Nassif is a former director of PIMS and he is now the Scientific Director of BIRS. The citation for the honorary degree is on page 5 of this newsletter.

New Deputy Director

Continued from page 1

Professor Adem's awards include the A.P. Sloan Doctoral Dissertation Fellowship (1985), the National Science Foundation Young Investigator Award (1992), the Romnes Faculty Fellowship (1995), and the Vilas Associate Award (2003).

Professor Adem brings to PIMS high scientific prestige and considerable administrative experience. He has been Chair of the Department of Mathematics at the University of Wisconsin-Madison (1999–2002), and he is currently co-chair of the Scientific Advisory Committee of MSRI.



PIMS PDFs for 2004

PIMS is pleased to announce the PIMS Postdoctoral Fellows (PDFs) for 2004. The members of the review panel were Kieka Mynhardt (UVic), Chen Greif (UBC), Derek Bingham (SFU), Sudarshan Kumar Sehgal (UA) and Michael Lamoureux (UC), chair of the review panel.

New PIMS PDFs:

Omer Angel: *Probability*. Supervised by Gordon Slade (UBC).

Wael Bahsoun: *Measurable Dynamics*. Chris Bose (UVic).

Boaz Ben-Moshe: *Computational Geometry*. Binay K. Bhattacharya (SFU).

Shlomo Hoory: *Expander Graphs*. Joel Friedman (UBC).

Hosne Ara Jasmine: *Computational Fluid Mechanics*. Bruce R. Sutherland (UA).

Antonia Kolokolova: *Computational Logic*. Eugenia Ternovska (SFU).

Youngsuk Lee: *Computing and Atmospheric Modeling*. Mary Catherine Kropinski/David J. Muraki (SFU).

Wilson Lu: *Statistics*. Derek Bingham (SFU).

Mario Pineda-Krch: *Mathematical Ecology*. Michael Doebeli (UBC).

Jens Rademacher: *Dynamics/Scientific Computing*. Michael Ward/Ralf Wittenberg (UBC/SFU).

Jonathan Walgate: *Quantum Information Science*. Barry C. Sanders (UC).

2003 PIMS PDFs Renewed in 2004:

Lyonell Boulton: *Spectral Theory of Linear Operators*. Paul Binding (UC).

Dominic Brecher: String Theory CRG (UBC).

Jae-Hun Jung: *Theoretical Chemistry, Spectral Methods*. Bernie Shizgal (UBC).

Kyungeun Kang: *Nonlinear PDEs*. Stephen Gustafson/Tai-Peng Tsai (UBC).

Friederich Littman: Number Theory CRG (UBC/SFU).

Frithjof Lutscher: Mathematical Ecology and Evolution CRG (UA/UC).

Jan Manuch: *Computer Science, Communication Complexity*. Arvind Gupta (SFU).

Bahram Rangipour: *Algebraic Topology*. John Phillips (UVic).

Anne-Gaëlle Rolland-Lagan: *Computer Science, Modelling and Simulation in Mathematics*. Przemyslaw Prusinkiewicz (UC).

Chris Rowe: Number Theory CRG (UBC/SFU).

Jacob Shapiro: *Algebraic Geometry, Gromov-Witten Invariants*. Kai Behrend/Jim Bryan (UBC).

Vardarajan Suneeta: Don Page (UA).

Jian-Jun Xu: Scientific Computing CRG (SFU).

Jianying Zhang: Scientific Computing CRG (UBC).

A Banquet in Honour of Barry McBride

On Friday May 21, 2004, PIMS and MITACS held a banquet in honour of Barry McBride at the University Golf Club near UBC. The banquet celebrated one of many legacies of Barry McBride: His defining role in the remarkable development of the mathematical sciences in western Canada during the last decade.

Barry McBride recently finished his term as Vice-President Academic and Provost of the University of British Columbia completing several decades of dedicated service to UBC and to Canada, both as an inspirational leader and as a tireless advocate for Canada's quest for academic excellence.

Notable among Barry's many achievements are his crucial contributions to the success of the mathematical science community in BC and Alberta with its hugely positive impact in the rest of Canada and the Pacific Northwest. Barry's leadership and unwavering support were instrumental in the creation of the Pacific Institute for the Mathematical Sciences (PIMS), the MITACS Network of Centres of Excellence, the Banff International Research Station (BIRS), as well as in the emergence of UBC's mathematical science community to a position of worldwide prominence.



Dinner speeches celebrating the contributions of Barry McBride

Top row: John Waterhouse, VP Academic at SFU; John Hepburn, Dean of Science, UBC with Nassif Ghoussoub; Indira Samarasekera, VP Research at UBC.

Second row: Arvind Gupta, Scientific Director of MITACS, and Ivar Ekeland, Director of PIMS; Barry McBride; Nassif Ghoussoub, BIRS Scientific Director, MC for the event.

Last row: Ivar Ekeland and Barry McBride; Barry McBride, John Waterhouse and Ken Foxcroft (former Board Member of PIMS).

VIGRE grant to UW

Continued from page 1

The main goal of VIGRE is to attract and retain more US citizens and permanent residents into the mathematical sciences at all levels. This award builds on the accomplishments of a previous VIGRE award to the UW in 1999, one of the first given, but at a level that is nearly double that of the previous award. The competition was keen: out of 29 proposals only three were funded.

The principal investigators on the VIGRE grant are Douglas Lind, Loyce Adams, Peter Gutterop, Selim Tuncel, and Kai-Kat Tung. One of the components of this VIGRE award is integration with PIMS in order to create new research opportunities for students, postdocs, and faculty of the University of Washington.

The VIGRE award will further strengthen the ties between PIMS and the University of Washington, and provide new avenues to support our collaborations.



Call for proposals for BIRS 2006

The Banff International Research Station for Mathematical Innovation and Discovery (BIRS) is now accepting proposals for its 2006 programme.

Complete information, guidelines, and online forms are available at the BIRS website <http://pims.math.ca/birs>.

BIRS will be again operating for 40 weeks in 2006 and will be running each week, either a full workshop (40 people for 5 days) or two half-workshops (20 people for 5 days). BIRS provides full meals, accommodation, and research facilities at no cost to organisers and invited participants, in a setting conducive to research and collaboration.

The deadline for 5-day workshop proposals and Summer Schools is **October 15, 2004**.

In addition, BIRS will host 2-day workshops. BIRS will also operate its Research in Teams and Focused Research Groups programmes, which allow smaller groups of researchers to get together for several weeks of uninterrupted work at the station.

October 15, 2004 is also the preferred date to apply for these programmes. Proposals for projects other than 5-day workshops, however, can be submitted anytime — subject to availability — at least 4 months before their requested start date.

If possible, proposal submissions should be made using the online submission form at <http://www.pims.math.ca/birs/>.

Citation for Dr Ghoussoub's Honorary Doctorate



Nassif Ghoussoub est arrivé en France en 1973, après de brillantes études à l'Université Libanaise de Beyrouth. En 1979 il obtenait sa thèse d'Etat en mathématiques, sous la direction du professeur Brunel. La pénurie de postes qui sévissait alors en France le conduisit à poursuivre sa carrière outre-Atlantique. En 1981 il obtenait un poste à l'Université de Colombie Britannique, où il est encore aujourd'hui.

Sa carrière scientifique a été brillante, et traverse plusieurs domaines des mathématiques : théorie ergodique, espaces de Banach, méthodes variationnelles, équations aux dérivées partielles. Il a obtenu les plus hauts honneurs que peut décerner le Canada : prix Coxeter-James en 1990, bourse Killam en 1992, membre de la *Royal Society of Canada* depuis 1993.

Nassif Ghoussoub a mis au service de la communauté mathématique canadienne sa créativité et son énergie. En 1996, il fonde le *Pacific Institute of Mathematics*, qui fédère les mathématiciens des deux grandes provinces de l'Ouest, en 1997 il fonde une autre institution, MITACS, qui développe les mathématiques en milieu industriel, et en 2002 il fonde le *Banff International Research Center*, un lieu de rencontre pour les chercheurs du monde entier. Ces trois entreprises ont transformé les conditions de la recherche mathématique au Canada, et ont eu immédiatement un retentissement international.

Tous ceux qui ont approché Nassif Ghoussoub connaissent la force de sa personnalité et son infatigable énergie. C'est une très grande chance pour le Canada qu'elles soient au service d'une intelligence lucide, auréolée d'un grand prestige scientifique, cherchant à créer les conditions favorables à la recherche à l'échelle de toute une région, et qui a su galvaniser autour de ses idées toute une communauté. Mais Nassif est aussi un fils de la France, qui en a fait un mathématicien, et où ses attaches personnelles et scientifiques sont nombreuses. En lui décernant ce Doctorat Honoris Causa, l'Université Paris-Dauphine témoigne de la force de ces liens, et de la traditionnelle amitié franco-canadienne.

Citation by Ivar Ekeland



The Pre-Arrival BIRS Team: Jacqueline Kler (BIRS Programme Coordinator), Dil Bains (UVic Admin Assistant) and Barbara Dempsey (BIRS Admin Assistant)

New BIRS Scientific Director

Continued from page 1

Dr Ghoussoub was the recipient of the Coxeter-James prize in 1990, of a Killam senior fellowship in 1992 and has been a fellow of the Royal Society of Canada since 1993. He was chair of NSERC's grant selection committee for mathematics in 1995–1996 and vice-president of the Canadian Mathematical Society from 1994 to 1996. He was co-editor of the *Canadian Journal of Mathematics* from 1993 to 2002 and is currently on the editorial board of various international journals. His present research interests are in non-linear analysis and partial differential equations.

As Scientific Director of BIRS, Dr Ghoussoub will be responsible for the overall functioning of the scientific and intellectual activities of the Station, and will act as an ambassador and as its public representative. He will chair its Scientific Advisory Board and its Steering Committee and will make sure that all scientific activities of the Station are run at the standards and with the integrity expected by its sponsoring foundations and granting councils.



Banff International Research Station: 5-Day Workshops in 2005

Mar 12–17 **Dynamics, Probability, and Conformal Invariance**: P. Jones (Yale), M. Yampolsky (Toronto), I. Binder (Toronto), S. Rohde (Washington)

Mar 19–24 **Computational Fuel Cell Dynamics-III**: B. Wetton (UBC), K. Promislow (Michigan State), J. St. Pierre (Ballard)

Mar 26–31 **Representations of Kac-Moody Algebras and Combinatorics**: V. Chari (UC Riverside), G. Cliff (Alberta), P. Littellmann (Wuppertal), N. Reshetikhin (Berkeley)

Apr 2–7 **Workshop in Homotopical Localization and the Calculus of Functors**: G. Peschke (Alberta), K. Bauer (Calgary), R. Cohen (Stanford), H. Sadofsky (Oregon)

Apr 9–14 **Complex Data Structures**: J. Stafford (Toronto), J. Berger (SAMSI), M. Thompson (Waterloo), N. Reid (Toronto)

Apr 16–21 **Numerical Relativity**: R. LeVeque (Washington), M. Choptuik (UBC), L. Lehner (Louisiana State), D. Arnold (Minnesota), E. Tadmor (Maryland)

Apr 23–28 **Applications of Torsors to Galois Cohomology and Lie Theory**: A. Pianzola (Alberta), V. Chernousov (Alberta), S. Kumar (North Carolina), D. Harari (ENS Paris)

Apr 30–May 05 **Micro- and Nano-fluidic Systems Descriptions**: J. Harrison (Alberta), J. Santiago (Stanford), K. Jensen (MIT)

May 7–12 **Aggregation and Disaggregation: Characterization and Identification of Collective Demand**: P. A. Chiappori (Chicago), I. Ekeland (UBC)

May 14–19 **Densest Packings of Spheres**: K. Bezdek (Calgary), H. Cohn (Microsoft Research), C. Radin (Texas, Austin)

May 21–26 **Moment Maps in Various Geometries**: E. Lerman (Illinois UC), L. Jeffrey

(Toronto), E. Meinrenken (Toronto), Y. Karshon (Toronto), T. Holm (Berkeley)

May 28–June 2 **Critical Scaling for Polymers and Percolation**: D. Brydges (UBC), J. Chayes (Microsoft Research), G. Slade (UBC)

June 4–9 **Mathematical Issues in Molecular Dynamics**: P. Tupper (McGill), R. Skeel (Illinois UC)

June 11–16 **Geometric and Asymptotic Methods in Group Theory**: A. Rhemtulla (Alberta), M. Sapir (Vanderbilt), R. Grigorchuk (Texas A&M), A. Olshanskiy (Vanderbilt), D. Wise (McGill)

June 18–23 **Combinatorial Game Theory Workshop**: R. Nowakowski (Dalhousie), E. Berlekamp (Berkeley), M. Müller (Alberta), D. Wolf (GustavusAdolphus)

July 9–14 **Rigidity, Dynamics, and Group Actions**: D. Fisher (Lehman, CUNY), R. Spatzier (Michigan), D. Witte Morris (Lethbridge)

July 16–21 **Mathematical Biology of the Cell: Cytoskeleton and Motility**: L. Keshet (UBC), A. Mogilner (UC Davis), P. Janmey (U Penn), E. Cytrynbaum (UBC)

July 30–Aug 4 **Renaissance Banff: Mathematics, Music, Art, Culture**: R. Moody (Alberta), N. Ghousseub (UBC), C. Rousseau (Montreal), R. Sarhangi (Towson), J. Morrow (Banff Centre)

Aug 20–Aug 25 **Mathematical Epidemiology**: P. van den Driessche (Victoria), H. Hethcote (Iowa), S. Levin (Princeton)

Aug 27–Sept 1 **Topology**: R. Stern (UC Irvine), I. Hambleton (McMaster), M. Hopkins (MIT), M. Kreck (Heidelberg)

Sept 3–8 **Workshop on Analytic and Algebraic Methods in Complex and CR Geometry**: J. Bland (Toronto), Y.-T. Siu (Harvard), J. Kohn (Princeton), L. Lempert (Purdue), J. D'Angelo (Illinois UC)

Sept 10–15 **Interactions Between Noncommutative Algebra and Algebraic Geometry**: C. Ingalls (New Brunswick), M. Artin (MIT), Z. Reichstein (UBC), L. Small (UC, San Diego), J. Zhang (Washington)

Sept 17–22 **Order, Disorder, and Transport: Recent Advances in Schrödinger Operator Theory**: P. Hislop (Kentucky), R. Froese (UBC), V. Jaksic (McGill), A. Klein (UC, Irvine)

Sept 24–29 **Time-frequency Analysis and Nonstationary Filtering**: G. Margrave (Calgary), H. Feichtinger (Vienna), K. Groechenig (Connecticut), M. Lamoureux (Calgary)

Oct 1–6 **Challenges in Linear and Polynomial Algebra in Symbolic Computation Software**: E. Kaltofen (North Carolina State), W. Decker (Saarlandes), K. Geddes (Waterloo), S. Watt (Western Ontario)

Oct 8–13 **Progress in Algebraic Geometry Inspired by Physics**: M. Thaddeus (Columbia), J. Bryan (UBC), R. Vakil (Stanford)

Oct 15–22 **MITACS Week**

Oct 22–27 **Visco-plastic Fluids: from Theory to Application**: I. Frigaard (UBC), N. Balmforth (UC, Santa Cruz)

Oct 29–3 **Probabilistic Combinatorics: Recent Progress and New Frontiers**: B. Sudakov (Princeton), N. Alon (Tel Aviv), B. Reed (McGill), V. Vu (UC, San Diego)

Nov 5–10 **Number Theory Inspired by Cryptography**: D. Boyd (UBC), C. Pomerance (Dartmouth), I. Shparlinski (Macquarie), H. Williams (Calgary)

Nov 19–24 **MSRI Hot Topic**

Dec 3–8 **PIMS Hot Topic**

Dec 10–15 **Regulators II**: J. Lewis (Alberta), V. Snaith (Southampton)

Focused Research Groups (FRG), Research in Teams (RIT), Summer Schools (SS) & 2-Day Workshops in 2005

Mar 12–26 **Analysis, Computations, and Experiments on Pinch-off in Liquid Jets** (FRG): R. Miura (New Jersey), H. Huang (York), D. Papageorgiou (New Jersey), M. Siegel (New Jersey)

Mar 17–19 **Second Northwest Functional Analysis Symposium** (2-day): V. Runde (Alberta)

Apr 30–May 14 **Speciality of Malcev Algebras** (RIT): M. Bremner (Saskatchewan), I. Hentzel (Iowa)

May 12–14 **The Dark Side of Extra Dimensions** (2-day): V. Frolov (Alberta), D. Page (Alberta)

May 14–28 **Affinizations of Extended Affine Lie Algebras** (RIT): A. Pianzola (Alberta), B. Allison (Alberta), S. Berman (Saskatoon)

May 19–21 **Convex and Abstract Polytopes** (2-day): E. Schulte (Northeastern), T. Bisztriczky (Calgary), A. Weiss (York)

May 28–Jun 11 **Influenza Dynamics: Models and Data** (FRG): D. Earn (McMaster), J. Dushoff (Princeton), J. Plotkin (Harvard)

Jun 9–11 **Meeting of Canadian CS Chairs - CACS/AIC** (2-day): G. McCalla (Saskatchewan), K. Barker (Calgary)

Jun 11–18 **Hyperplane Arrangements: Cohomology and Rational Homotopy** (FRG): G. Denham (Western Ontario)

Jun 22–Jul 4 **2005 Summer IMO Training Camp** (SS): B. Sands (Calgary)

Jun 25–Jul 9 **PIMS Summer School** (SS)

Jul 16–30 **Topological Methods for Aperiodic Tilings** (FRG): I. Putnam (Victoria), Kellendonk (Lyon), L. Sadun (Texas, Austin)

Jul 21–23 **Connecting Women in Mathematics Across Canada II** (2-day): M. Dubiel (SFU), R. Kuske (UBC), G. de Vries (Alberta)

Aug 6–20 **Computing the Continuous Discretely: Integer-point Enumeration in Polyhedra** (SS): M. Beck (MSRI), S. Robins (Temple)

Aug 25–Sep 3 **Symmetries of Extremal Conformal Mappings** (RIT): E. Schippers (Michigan)

Nov 5–12 **Hyperbolic Geometry and Quasiconformal Mappings** (FRG): P. Bonfert-Taylor (Wesleyan), M. Bridgeman (Boston), R. Canary (Michigan), G. Martin (Auckland), R. Schwartz (Maryland), E. Taylor (Wesleyan)

Date TBA **The Kneser-Poulsen Conjecture** (2-day): K. Bezdek (Calgary), R. Connelly (Cornell)

Date TBA **Number Theory in Mirror Symmetry** (RIT): N. Yui (Queens)



The Creative Scientific Writing Workshops at BIRS

An interview with and by the organisers: Marjorie Senechal (Smith College) and Chandler Davis (University of Toronto)

In the spring of 2004, tucked in between workshops on mathematical logic and foundations, manifolds and cell complexes, Fourier analysis, numerical analysis, probability theory and stochastic processes, mechanics of particles and systems, game theory, economics, social and behavioural sciences, dynamical systems and ergodic theory, and quantum theory, BIRS held its second five day experimental workshop on creative scientific writing. The first took place in September, 2003. Curious colleagues have asked us, and continue to ask, what these workshop were like and what they accomplished. In the self-interview that follows, we address these and other questions.

Why hold workshops on creative scientific writing at BIRS or anywhere else? Mathematics is an art form, so isn't mathematical writing creative?

Alas, the population that recognizes the creativity in a mathematical or scientific paper is smaller by many orders of magnitude than the number who remember their Latin. By *creative scientific writing* we mean something else: mathematical and scientific ideas as subjects for poetry, drama, short stories, novels, nonfiction, comic books, essays, and film.

Why would anyone write about science and mathematics in this way? Does anyone do it?

Mathematics is part of world culture, part of the human spirit. It's as fit a subject for art, music, and literature as any other. As for who, some mathematicians write poetry, fiction, nonfiction, or drama. And there are non-mathematician poets, fiction writers, nonfiction writers and dramatists whose work engages mathematicians

and mathematical ideas. Our first workshop had fifteen participants, all highly accomplished, and the second had twenty, ditto.

But aren't you mixing apples and eggs?

Talk about mixing! But, with garlic and salt, apples and eggs make an excellent omelet. We assumed from the start—and now we firmly believe—that non-mathematicians who write creatively about mathematics and mathematicians, and mathematicians engaged in creative writing, have a lot to teach and learn from one another.

Okay, but isn't it confusing to mix all those literary genres?

On the contrary! Creative writing is often sparked by cross-genre insights. For example, in our workshops a poet helped a fiction writer find a better way to tell the end of his story. A mathematician nonfiction writer helped a dramatist extend the ideas of her play, ideas a filmmaker sitting in on their discussions recast in doggerel form. A novelist had insightful comments on poetry. Of course, it helped a lot that we pressed everyone to circulate his or her work in advance. By the time we arrived in Banff, we'd read it all, thought about it, and were eager to comment.

Why should BIRS take the lead in encouraging this?

Call it "outreach" if you like, part of the larger effort of mathematicians everywhere in these days of dwindling funds to explain who we are and what we do — and why it matters. Or, if you prefer, an effort to engage scientists and mathematicians in a wider world of discourse. The need to create a body of literature around mathematics and science is widely acknowledged by mathematicians and non-mathematicians alike.

But is there an audience for creative scientific writing, as you describe it?

The popularity of plays like *Proof* and biographies like *A Beautiful Mind* and *The Man Who Loved Only Numbers* show that there's a large and growing public eager to share in the great ideas of mathematics and science. The creative writer's job is not to coerce them to eating these things like medicine hidden in jam, but to convey these ideas through literature instead of formalism.

Yet except for obvious examples, like those you cited, creative writing about the content of mathematics is extremely rare and creative writing about the activity of mathematical creation is even rarer.

That's why we organised the workshops: to encourage practitioners who engage this content in their work. To give them opportunities to discuss important issues, to learn what others are doing, to encourage each other, to critique current work, to welcome young writers into the field, to spark collaborations, to forge networks and build community.

Then the creative writing workshops' goals are the same as any other BIRS workshop!

Yes, but as we noted in our report to BIRS after the first workshop, our program is, of necessity, highly experimental. In the first workshop we followed the standard practice of assigning each participant an hour lecture slot. But that didn't always give people the detailed, line-by-line, feedback some hoped for. And a few people read work they'd already published, so feedback was moot. We found we needed to set aside time for other things too. So, for the second workshop we modified the format in various ways.

How did you organise the time?

Well, a typical day went like this:

8–9: Breakfast in Corbett Hall, BIRS's headquarters

9–10: Reflections: the full group meets to discuss, orally or in writing, issues raised or works presented the previous day; further ideas and inspirations.

10–11 and 11–12: Two presentations of works-in-progress to the full group, followed by discussion.

12–1:30: Lunch

1:30–4:30: Time free for writing

4:30–6: Parallel sessions — as many as anyone wished — on works-in-progress in small groups, two to ten, for line-by-line comments and editing

6–7:30: Dinner in the Banff Centre dining hall

7:30–9: Discussions of general issues, or public readings with participants in the Banff Centre's workshop *Writing With Style*.

Tell us about the evening discussions.

The first was called, "What, Why, and For Whom?" It covered a lot of ground, from lamenting math phobia and emphasizing the need for better science and mathematics education, to considering the many forms that outreach can



Participants at the 2004 BIRS Creative Scientific Writing Workshop

take. And we lamented the worm in the apple: *Proof, A Beautiful Mind* and other popular works wouldn't have been so successful had the mathematician character been sane.

Audiences always prefer demented geniuses, or flawed ones. Not only scientists and mathematicians. Think of Amadeus, about Mozart, and all those films about van Gogh.

It's true, it's very difficult to portray intellectual creativity of any kind. But the scientific/mathematical nut is tougher to crack — sorry, wrong metaphor. I mean, the mad composer or painter or writer can be shown composing or painting or writing madly, furiously, but in the end he or she produces something the public can hear or see or read. While a mathematician, mad or sane, produces a mystifying theorem. But on the other hand, the play *Copenhagen* was a great success and the novel *Einstein's Dreams* conveys the scientific creative process in a beautiful way. And *Arcadia*, a funny and chaotic play whose leitmotif is chaos theory, is a modern classic. The mathematical formalism is symbolized in its structure.

Using a mathematical structure to talk about math — that reminds me of a sonnet by Edna St. Vincent Millay, "Euclid alone has looked on Beauty bare." The poem's strict form mirrors deductive geometry's austere beauty. "Fortunate they Who, though once only and then but far away, Have heard her massive sandal set on stone." Would you say the sonnet form has mathematical affinities?

One of us would, the other wouldn't. But that's a discussion topic for a future workshop. Back to your earlier question: our discussion the last night was, "Where Do We Go From Here?"

The last night? Then tell us first about the public readings.

Well, as you know, BIRS is located in the world-renowned Banff Centre. With studios nestled in the woods, outstanding mentors, excellent performance spaces and a fine library, the Banff Centre nurtures aspiring, mid-career, and established musicians, painters, photographers, writers, and actors. Artists love Banff. And Banff loves the artists: the centre's world-class exhibitions, public readings, and performances enhance Banff's appeal to tourists year-round. The BIRS leadership hopes BIRS will interact with the Centre. So in organising our workshops, we worked closely with Carol Holmes and Edna Alford of the Banff Centre's Writing and Publishing Program. Their "Writing in Style" workshop and our second workshop took place the same week. On two evenings, we merged the

two groups for informal public readings. A few participants in other BIRS and Banff Centre programmes attended too. We hosted an evening of poetry, with eleven readers from both groups. They hosted a prose reading evening, with fewer readers of course, but again from both groups.

And were these readings successful?

Very. Participants in the two groups met one another and some of their conversations continued at meals the next day. Another important benefit was the opportunity for writers, in both groups, to read their work to and get responses from audiences outside their usual orbits.

So where do we go from here?

In many directions! Workshop participants plan to stay in touch, and to keep each other informed of the progress of their work. We will share infor-

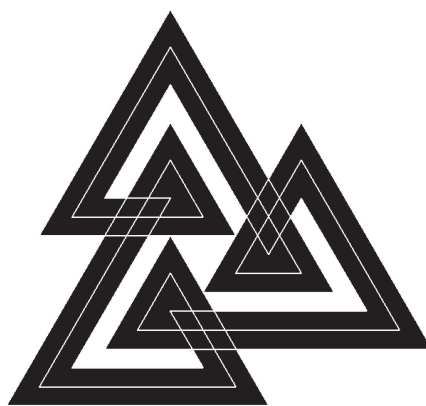
mation about publishers and agents. Someone suggested we ask BIRS to link our publications to its website. The Mathematical Intelligencer already encourages creative writing in mathematics, but we want it to do even more. We hope to hold another workshop at BIRS in the future, in close association with Banff Centre writing programs, and to publish an anthology under their auspices.

I can see it now: a hefty tome, the year's Best Creative Writing in Mathematics.

Yes, the hottest item in the bookstore, its sales topping the year's best short stories, best essays, best mystery stories, best political fiction, best non-required reading, best recipes, best science and nature writing, best spiritual writing, best sports writing, best travel writing, and best erotica.

Hors de doute. Merci.

RENAISSANCE BANFF



**Renaissance Banff
A Mathematics-Arts
Conference at the
Banff Centre, Banff, Alberta**

July 31 to August 3, 2005

**[http://www.pims.math.ca/
RenaissanceBanff/](http://www.pims.math.ca/RenaissanceBanff/)**

RenaissanceBanff@pims.math.ca

**Organisers: Reza Sarhangi,
Christiane Rousseau,
Nassif Ghoussoub, Robert Moody**

**Renaissance Banff Logo designed by
Robert J. Krawczyk**

The Banff Centre, the CMS, and PIMS will host a 4-day conference bringing mathematicians and artists together to encourage and demonstrate the many exciting connections that link the world of mathematics to the visual arts, music, sculpture, architecture, poetry, computer graphics, theatre, and indigenous cultures.

The conference is the first time the very successful international Bridges Conference (<http://www.sckans.edu/~bridges/>) is coming to Canada, and to celebrate this, one day will be devoted to the life-long interests and connections of the late Donald Coxeter to the world of artists and the arts, and to ways of continuing and encouraging his legacy.

The conference will also be of great interest to teachers at all levels in mathematics.

- General Sessions: to introduce new and innovative approaches in mathematical connections in science and art by inviting international scholars and artists as invited speakers.
- Special Sessions: the conference encourages participants to contribute to the conference by presenting their own works in the Special Sessions.
- Workshop Sessions: providing opportunities for participants to watch and work hands-on with established artists who are crossing the mathematics-arts boundaries.
- Musical and theatrical performances.
- Conference Proceedings: available at the time of the conference — a resource book and guide to further exploration of the talks and exhibits of the conference.



PIMS Collaborative Research Group Activities Summer 2004

PIMS CRG on Number Theory



Number Theory CRG: PIMS Distinguished Chair Bjorn Poonen (shown above) from UC, Berkeley spoke at the Computational Arithmetic Geometry Workshop at PIMS SFU, July 5–9, 2004. In April 2004 Sergei Konyagin (Moscow State University) delivered a PIMS Distinguished Chair lecture series at UBC.

PIMS CRG on String Theory



String Theory CRG: Participants in this year's Frontiers of Mathematical Physics Conference posing outside the PIMS-UBC office.

PIMS CRG on Scientific Computing



Scientific Computing CRG: There were two PIMS Distinguished Chairs with the Scientific Computing CRG in summer 2004. Otmar Scherzer (left) from the University of Innsbruck visited UBC, and Chris Budd (right) from the University of Bath visited SFU.

PIMS CRG on Mathematical Ecology and Evolution



Mathematical Ecology and Evolution CRG: Participants of the International Conference on Differential Equations and Applications in Mathematical Biology which was held in Nanaimo, BC, July 18–23, 2004. For more information please see <http://web.mala.bc.ca/math/conference/>.

PIMS CRG on Dynamics & Related Topics



Dynamics and Related Topics CRG: Participants of the BIRS Workshop on Aperiodic Order: Dynamical Systems, Combinatorics, and Operators, May 29–June 3, 2004.

PIMS CRG on Probability and Statistical Mechanics



Probability and Statistical Mechanics CRG: Participants of the Summer School in Probability in the recently renovated PIMS conference room at UBC. The summer school took place from May 25–June 25, 2004.



Probability and Statistical Mechanics CRG: Robert Wolpert (Duke, former student of Ed Nelson), Gerald Folland (Washington), Greg Lawler (Cornell) and Ed Nelson (Princeton) outside PIMS-UBC. They were part of "Analysis, Probability, and Logic: A Conference in Honour of Edward Nelson" which was held June 17–18, 2004.

PIMS CRG on Topology & Knot Theory



Topology and Knot Theory CRG: This summer the main activity of this CRG was the "Knots in Vancouver" programme. The workshop in Knot Theory and 3-Manifolds was held at UBC, July 19–23, 2004, preceded by the MSRI-PIMS Summer Graduate Programme: Knots and 3-Manifolds at UBC, July 7–20, 2004.

Call for Proposals:

Letters of Intent — Periods of Concentration for CRGs

PIMS invites interested researchers to submit letters of intent for periods of concentration of a collaborative research group to start in or after April 2006. Deadline: October 15, 2004. Letters of intent should be 2–4 pages long. On advice of the PIMS Scientific Review Panel the PIMS Director will invite successful groups to submit a full proposal for a period of concentration. Full proposals are usually developed in consultation with the PIMS Deputy Director and Site Directors.

For more details please consult the "Opportunities" section of the PIMS website at pims.math.ca.

Long Arithmetic Progressions of Primes

By Ben Green, Trinity College, Cambridge, Former PIMS Postdoctoral Fellow

In Spring 2004, while I was a PIMS postdoc in Vancouver, Terry Tao of UCLA and I published an article about arithmetic progressions of prime numbers. Whilst the article has not yet been accepted for publication by a journal, it does seem appropriate to give a very brief description of the results and methods in this newsletter.

The sequence of prime numbers $2, 3, 5, 7, \dots$ has been studied for over 2000 years. The appeal of prime numbers to mathematicians is perhaps that they are extremely simple and natural to define, but it is often very difficult or impossible to prove facts about them. As an example, consider the 250 year-old conjecture of Goldbach, which suggests that every even number greater than 2 is a sum of two prime numbers. It is easy to verify this for small values (e.g. $50 = 19 + 31$, $100 = 47 + 53$) and to come up with heuristic arguments which suggest that the conjecture is true. So far, however, no-one has been able to supply a proof. The same goes for the Twin Prime Conjecture, which states that there are infinitely many pairs of primes which differ by two, such as $(3, 5)$ and $(41, 43)$.

Our work concerns arithmetic progressions of primes. The sequence $5, 11, 17, 23, 29$ is an arithmetic progression of five primes, and the sequence

$$56211383760397 + 44546738095860k, \quad k = 0, 1, \dots, 22,$$

is an arithmetic progression of 23 primes, which is the longest currently known (this latter example was discovered on July 24, 2004, by Frind, Jobling and Underwood).

Our result is that there are arbitrarily long arithmetic progressions of primes. We can actually prove that there is a k -term arithmetic progression of primes, all of which are at most

$$2^{2^{2^{2^{2^{100k}}}}},$$

though this spectacularly large bound (a number with approximately $\frac{1}{3}2^{2^{2^{2^{2^{100k}}}}}$ digits) is unlikely to be greeted with much excitement by computational mathematicians!

We have not really found a new way of understanding prime numbers. The main advance in our work is a better understanding of arithmetic progressions. A famous result about arithmetic progressions is the 1975 theorem of Endre Szemerédi. This states that if A is a subset of $\mathbb{N} = \{1, 2, \dots\}$ with positive density (say A contains one percent of all natural numbers) then A contains arbitrarily long arithmetic progressions.

Unfortunately, this result does not apply to the set of primes since they do not form a set of positive density. Indeed, the famous Prime Number Theorem tells us that the number of primes less than N is about $N/\log N$.

Our main result is a version of Szemerédi's Theorem in which the set \mathbb{N} is replaced by a more general type of set. Very roughly speaking, we show that if a set $S \subseteq \mathbb{N}$ is "pseudorandom" then any set containing a positive proportion of S contains arbitrarily long arithmetic progressions. The set S need not have positive density (it can actually be quite sparse).

Once this result is proved, one must construct a set S which is appropriate for the primes. Simplifying matters somewhat for the sake of exposition, we take S to be something like the set of "almost-primes", that is to say numbers n , all of whose prime factors are at least $n^{1/1000}$. The primes form a positive density subset of S , but S is a much more tractable object than the primes themselves. Indeed by "massaging" S a little bit one can show using techniques of classical analytic number theory, that S is pseudorandom.

In constructing S the authors enjoyed a rather large slice of luck. In March 2004 I was visiting Andrew Granville in Montréal, and I told him about my work with Terry. At that stage we did not quite understand how to massage the almost-primes in a way that would enable us to prove pseudorandomness. Andrew was able to direct us to some recent (as yet unpublished) work of Dan Goldston and Cem Yıldırım. Although the work of Goldston and Yıldırım concerns a very different problem, it turned out that a certain lemma in their paper constituted a very good definition of S together with a proof that S is pseudorandom.

The most original part of our work is the proof of a version of Szemerédi's Theorem relative to an arbitrary pseudorandom set S . The argument is strongly motivated by a branch of mathematics called ergodic theory, which has proved very useful in the study of arithmetic progressions since groundbreaking work of Furstenberg in the late 1970s.

We prove, then, that any set consisting of a positive proportion of S contains arbitrarily long arithmetic progressions. Subsequently we apply this to the specific set S discussed above, which is related to the almost-primes. A number of mathematicians have remarked to us that this is precisely why we are successful – history indicates that isolating properties of the primes themselves is a very tricky business, but here we have been able to exhibit the primes as a specific instance of a larger class of sets (the positive density subsets of S). For exactly this reason, it would be optimistic to expect our methods to shed any light on the Goldbach or Twin Prime conjectures in the near future.



Ben Green (Trinity College, Cambridge)

The paper to which this article refers, *The primes contain arbitrarily long arithmetic progressions* by B. Green and T. Tao, is available at <http://www.arxiv.org/abs/math.NT/0404188>.





The GIMMC 2004 Mentors (left-right): C. Sean Bohun (Penn State U), Tim Myers (U of Cape Town), Tobias Schaefer (U of North Carolina at Chapel Hill), Petra Berenbrink (SFU), Randall Pyke (UC of the Fraser Valley, Abbotsford, BC) and Peter Ehlers (U of C)

7th PIMS-MITACS Graduate Mathematics Modelling Camp University of Victoria, May 10–14, 2004



The 7th Annual PIMS-MITACS Graduate Mathematics Modelling Camp (GIMMC) was a resounding success this year.

The six mentors and problems were:

C. Sean Bohun (Penn State University): *Optimal Design of Gas Burst Gene Gun*

Tim Myers (University of Cape Town): *Modelling the Temperature Distribute in Concrete Structure*

Tobias Schaefer (University of North Carolina at Chapel Hill): *Modelling Nonlinear Pulse Propagation in Optical Transmission Lines*

Petra Berenbrink (Simon Fraser University): *A Game Theoretical Approach to Modelling Network Growth*

Randall Pyke (University College of the Fraser Valley, Abbotsford, BC): *Path Planning for an Autonomous Robot*

Peter Ehlers (University of Calgary): *Assessment of Stormwater Concentration Data*

The organisers were **Rex Westbrook** and **Kes Salkauskas** (U of C). The local organising committee at UVic consisted of **David Leeming**, **Reinhard Illner**, **Pauline van den Driessche**, and **Julie Zhou**.

This year GIMMC was co-sponsored by MITACS.

For more information please see <http://www.pims.math.ca/industrial/2004/gimmc/>.

2nd PIMS Crystal Growth Workshop

Contributed by C. Sean Bohun, Penn State University

In January PIMS hosted the Second PIMS Crystal Growth Workshop at UBC. The mandate of the group is to improve semiconductor manufacturing through scientific modelling. Since the inaugural meeting in May 2002, advances have been made in three specific areas: 1) Modelling the crucible fluid flow; 2) Analysis of the gas flow and heat transfer; and 3) Understanding the crystal stress, shape and growth dynamics. Research is ongoing and the industrial partner is beginning to implement some of the suggested changes to the growing environment identified by the modelling team. The crystal group consists of researchers from across Canada, the United States, and South Africa.



The Crystal Group: Standing, from left-right, are Naveen Vaidya (York), Shuqing Liang (York), Mike Ebbehøj (UBC), Thomas Brakel (UBC/Cape Town), Colin Carrew (Firebird Semiconductors), Ian Frigaard (UBC). Sitting are C. Sean Bohun (Penn State) and Bill Micklethwaite (Firebird Semiconductors). Missing are Huaxiong Huang (York), Tim Myers (Cape Town) and Yuri Skrynnikov (UBC).

8th PIMS-MITACS Industrial Problem Solving Workshop PIMS-UBC, May 17–21, 2004

The 8th Annual PIMS-MITACS Industrial Problem Solving Workshop was held at UBC.

The four industry presenters and problems were:

Bill Mawby (Michelin Tire Corporation): *Statistical Design of an Experimental Problem in Harmonics*

Surrey Kim (Random Knowledge): *Analyzing Network Traffic for Malicious Hacker Activity*

John Ceko (Husky Injection Molding Systems): *The Effects of Impact on Design Features*

Kenneth J. Hedlin (Husky Energy) and Gary Margrave (U of C): *Seismic Attenuation Problem*

The organisers were **Rex Westbrook** and **Kes Salkauskas** (University of Calgary).

This year IPSW was co-sponsored by MITACS.

Please see <http://www.pims.math.ca/industrial/2004/ipsw/>.

2004 IPSW PIMS-Slips

The winner of the PIMS-slip contest at this year's IPSW was:

"Saying it out loud makes me not sure if I agree with what I just said"

Sean Bohun (Penn State University)

The runner-up was:

"21 is a prime, and it's a great prime, but let's pretend it isn't"

Malcolm Roberts (University of Alberta)

CANQUEUE 2004 Okanagan University College Capri Hotel, Kelowna, BC September 24–25, 2004



Canada's premiere conference in queuing theory is organised by Winfried Grassmann (University of Saskatchewan) and Javad Tavakoli (Okanagan University College).

The CanQueue conference series was initiated by Attahiru S. Alfa from the University of Manitoba, in 1999. The first workshop, in Winnipeg, was followed by workshops in London 2000, Waterloo 2001, Saskatoon 2002 and Toronto 2003. CanQueue is a forum where scientists, researchers, engineers, executives and students in the field meet to encourage on-going research and to discuss work-in-progress.

Jean C. Walrand (UC, Berkeley) will be the keynote speaker at the 2004 CanQueue Conference. The keynote address will be titled "Queuing in wireless and high-performance networks".

For more information see <http://www.pims.math.ca/science/2004/CanQueue/>.

Syncrude/PIMS/AMI Lecture Series at the U of Alberta

During the calendar year 2004 there will be a series of 6 lectures by distinguished national and international mathematicians. The lecture series is sponsored by Syncrude, organized by PIMS in consultation with Syncrude and hosted by the Applied Mathematics Institute (AMI) at the University of Alberta.

Topics will be related to the fundamental interests of Syncrude: Fluid dynamics, fluid dynamics with heat transfer and turbulence, imaging related to assessment of ore bodies, and process control.

The first lecture was on June 4, 2004, when **Daniel D. Joseph** (Regents Professor, IT Aerospace & Engineering, University of Minnesota) gave a talk entitled *Fluid Dynamics of Particle Formation*.



Daniel Joseph

Richard Stanley Day in Vancouver

The 16th Annual International Conference on Formal Power Series and Algebraic Combinatorics held at the University of British Columbia on June 28–July 2, 2004 included a special day. June 28 was declared *Richard Stanley Day* by Vancouver Mayor Larry Campbell.

The following declaration was read by Manfred Trummer (PIMS Deputy Director):

"Whereas Professor Richard Stanley of M.I.T. this month celebrated his sixtieth birthday, this occasion marked by a special conference last week in Boston; and

Whereas Professor Stanley's subject of combinatorics is of increasing importance in information technology and the knowledge economy; and

Whereas, in addition to his important research contributions, Richard Stanley has made an unmatched contribution to the education of young mathematicians, having graduated 38 doctoral students and written a two-volume book which is a standard graduate text in enumerative combinatorics; and

Whereas many of Richard Stanley's colleagues, former students, and their students are this week gathered in Vancouver for the 16th Annual Conference in Algebraic Combinatorics at UBC; therefore

Today the 28th day of June, 2004 is hereby proclaimed to be Richard Stanley Day in the City of Vancouver."



Upcoming PIMS/Shell Lunchbox Lectures in Calgary



The following lectures are planned for fall 2004:

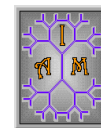
Barry Sanders (iCORE Professor of Quantum Information Science, University of Calgary): *Quantum Information Science*

Kristine Bauer (Mathematics and Statistics, University of Calgary): *Four Colors Suffice: Planar graphs, colorings and topology*

Rod Blais (Geomatics Engineering, University of Calgary): *Spherical Harmonic Transforms and Multiresolution Applications*

For more information see <http://www.pims.math.ca/industrial/2004/lunchbox/>

PIMS-IAM Distinguished Lectures



University of British Columbia
Institute of Applied Mathematics

September 20, 2004

George Homsy, UC Santa Barbara
Novel Marangoni Flows

October 25, 2004

Ray Goldstein, U. Arizona
A Stirring Tale of Bacterial Swimming and Chemotaxis

November 29, 2004

Andrea Bertozzi, UCLA
Higher Order PDEs in Image Processing

January 24, 2005

Roger Brockett, Harvard University
Dynamical Systems That Do Tricks

March 7, 2005

Adrian Nachman, U. Toronto
Inverse Problems in Medical Imaging

March 28, 2005

Ray Pierrehumbert, University of Chicago
Early-Life Crises of Habitable Planets



Contributed by Karen Booth, MITACS

Graduate Training Schools

MITACS offered a comprehensive set of Graduate Training Schools this summer.

Third Annual AARMS Summer School

July 12–August 6, 2004, Memorial University, St. John's, Newfoundland

Organizer: Edgar Goodaire (Memorial)

Courses in four subjects were offered: number theoretic cryptology, statistical genomics, mathematical biology and number theory.

Proteomics Workshop

July 19–24, 2004, Calgary, Alberta

Organizer: Canadian Genetic Diseases Network Canadian Bioinformatics Workshops Series

Students learned to visualize protein structures and make high quality images for publication, understand techniques used in high throughput proteomics, understand data resulting from proteomics, use public domain tools for modelling three-dimensional structures and understand concepts and methods involved in threading analyses.

Stochastic Calculus for Applications: Theory and Numerics

August 9–20, 2004, Montréal, Quebec

Organizers: Anne Bourlioux (Montréal) and Eric Vanden-Eijnden (NYU). With CRM.

The aim of this program was to cover all the essential concepts of stochastic calculus (including more elaborate ones like Girsanov transformation and path integrals) at a semi-rigorous level by relying only on the standard tools of basic probability, linear algebra, and advanced calculus.

Genomics Workshop

August 16–21, 2004, Vancouver, BC

Organizer: Canadian Genetic Diseases Network Canadian Bioinformatics Workshops Series

Participants in this detailed workshop gained practical skills and the understanding to install and use in-house information reference

systems, access Ensembl using Perl API, understand microarray data for gene expression, analyse Single Nucleotide Polymorphism (SNP) and genotype data, detect and analyse gene structures from eukaryotic genomes.

Minicourse in Mathematical Finance: Superhedging Under Portfolio Constraints—a Singular Stochastic Control Problem

June 14–18, 2004, PIMS at UBC

Organizer: Ulrich Haussmann (UBC)

Nizar Touzi presented a Minicourse at PIMS in June.

Analysis of Ecological Systems Under Uncertainty, Change, and Adaptation (PIMS Math Biology & Ecology CRG)

August 1–31, 2004, U. Calgary

Organizer: Ed McCauley (U. Calgary)

For more information about these Graduate Training Schools see www.mitacs.ca.

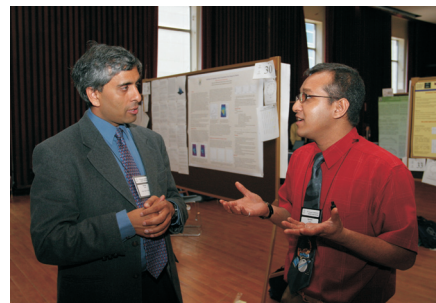
MITACS Internships

Over the past year, MITACS has piloted an initiative with the potential for broad impact on Canadian industry. The goal is to introduce a wider spectrum of industry to the power of mathematical sciences research while creating new research opportunities for graduate students and Post Doctoral Fellows. This programme also expands industry-university collaborations, and has the potential to retain many of the best students in Canada.

In 2003–04, ten internships were held in BC with nine different organizations. Examples are:

- Quantifying, Benchmarking and Predicting Risk for an International Shipping Company
- Predicting Wage Loss Duration for the Workers' Compensation Board of BC
- Distribution Network Planning for a Pulp and Paper Company
- Pre-Board Screening Analysis at a Canadian International Airport
- Planning an Automated Storage and Retrieval System for the UBC Library
- Developing a Foundation for Budgeting and Pricing for a Leading Resort Developer and Operator
- Improving Assignment and Activation Workflow at a Large Telecommunications Company

For more information contact Jim Brookes at jwbrookes@mitacs.ca.



Naveen Vaidya, former Intern on the Firebird Technologies project explains his research to Arvind Gupta, MITACS Scientific Director.

The National Programme on Complex Data Structures News

Contributed by Jamie Stafford, U. Toronto

The National Program on Complex Data Structures (NPCDS) is entering a period of heightened activity as it evolves collectively as a coherent network of projects with emerging designs for future ambitions. Various opportunities for the involvement of researchers, especially students, include three workshops in July, August and October of this year—where the availability of funding for student travel support has been announced; a call for proposals for inaugural NPCDS workshops—deadline: September 30, 2004; the availability of student research positions at Statistics Canada; joint PDFs at PIMS; planning of the joint NPCDS/SAMSI workshop at BIRS April 2005; and NPCDS interaction with SAMSI's thematic programme on Latent Variable Models in the Social Sciences.

September's call for proposals will likely be the last for the current funding cycle of NPCDS. While NPCDS will continue to support and advance existing projects, in time broader long term strategies will emerge that are aimed at NPCDS renewal as a network. While these will evolve on multiple fronts, the success of the National Program depends on the active involvement of statisticians from a variety of sectors across Canada. Those interested in providing input on important directions for the program are welcome to do so by contacting Jamie Stafford (stafford@utstat.utoronto.edu) or any member of the Scientific Committee. The NPCDS is a joint initiative of the Statistical Sciences Community of Canada and the nation's three Mathematics Institutes. Information about the program may be found at www.pims.math.ca/whatsnew/NPCDS_News_16Aug04.html.





The Pacific Institute for the Mathematical Sciences

On May 14, 2004, the Pi in the Sky Editorial Board met at BIRS to define editorial policy and procedures.

The following statement describes the intended audience: *Pi in the Sky Magazine is primarily aimed at high-school students and teachers, with the main goal of providing a cultural context/landscape for mathematics. It has a natural extension to junior high school students and undergraduates, and articles may also put curriculum topics in a different perspective.*

Pi in the Sky can be downloaded for free from www.pims.math.ca/pi.

If you are interested in submitting an article please contact pi@pims.math.ca.

The new editorial board is:

Editor in Chief: Ivar Ekeland (UBC)

Managing Editor: David Leeming (UVic)

Editorial Board: Len Berggren (SFU), John Bowman (UA), John Campbell (Archbishop MacDonald Academic High School, Edmonton), Florin Diacu (UVic), Sharon Friesen (Galileo Educational Network, Calgary), Dragos Hrimiuc (UA), Klaus Hoechsmann (UBC), Wieslaw Krawcewicz (UA), Michael Lamoureux (UC), Mark MacLean (UBC), Alexander Melnikov (UA), Volker Runde (UA), and Wendy Swonnell (Lambrick Park Secondary School, Victoria).

Editorial Coordinator: Heather Jenkins (PIMS).

The next issue will be out in the fall of 2004. The main theme will be *"How mathematics can be used to predict and suggest controls for disease"*.

PIMS Elementary Grades Math Contest UBC, May 29, 2004

The 6th Annual PIMS Elementary Grades Mathematics Contest (ELMACON) was organized by Shelley Alvarado, Cary Chien, Olga German, Klaus Hoechsmann, Heather Jenkins, Ilija Katic, Joshua Keshet, Fanny Lui, Natasa Sirotic and Elizabeth Towers. The contest ran smoothly with about 50 on-site volunteers including Jerry Chien and Sylvia Chan. A total of 244 students competed: 75 in Grade 5, 99 in Grade 6, and 70 in Grade 7. Next year, ELMACON will take place on April 30, 2005.

The list of winners of the 2004 contest can be found at <http://www.pims.math.ca/educations/2004/elmacon/>.



The top ten ELMACON 2004 winners in Grade 5

PIMS Graduate Information Event UVic, UBC, SFU, January 9–12, 2004

Contributed by David Leeming (UVic) and Manfred Trummer (SFU)

This year the PIMS Graduate Information Event was hosted in British Columbia. About 30 senior undergraduate students from all over Canada spent Friday at Simon Fraser University and Saturday at the University of British Columbia. At SFU students were welcomed by Jonathan Driver (Dean of Graduate Studies) and Rolf Mathewes (Associate Dean of Science). Students heard presentations from representatives from various graduate programmes, notably Pure Mathematics, Applied Mathematics, Computer Science and Statistics. The Universities of Alberta and Calgary also had faculty representatives at the SFU event. Students had the opportunity to see the campus and various research labs; there was also ample opportunity to meet informally with faculty members and graduate students.

PIMS at the University of Victoria hosted the second part of the Graduate Information event. After arriving on Sunday, the students were free to explore the city. In the evening, a reception was held at the Executive House Hotel, host hotel for the participants. There, the students were able to meet informally with faculty and graduate students from the Departments of Mathematics and Statistics, Physics and Computer Science.

On Monday, the students came to the University of Victoria campus where Aaron Devor (Dean of Graduate Studies) welcomed them. Then they heard presentations from faculty and graduate students on graduate degree programs in pure, applied and discrete mathematics, statistics, physics and astronomy, and computer science. The participants ended their day at UVic with a brief tour of the campus.

We are grateful for the generous support provided to this event by the participating universities and departments, as well as for the efforts of faculty members, graduate students and local PIMS staff.

Young Researchers' Forum in Mathematical & Statistical Sciences University of Alberta March 27–28, 2004

This was the first research forum organized for the graduate students of at the Universities of Alberta and Calgary. Twenty-five graduate students from Calgary and thirty-eight graduate students from Edmonton registered for this event. Ten of these students presented their research work covering topics from pure and applied mathematics and statistics. These presentations were well received by their fellow graduate students at the forum.

The participants had the opportunity to learn about and discuss the research done at both universities. A general discussion was arranged for feedback at the end of the forum. A second research forum is being considered for next year at BIRS.

Changing the Culture 2004 Mathematics Curriculum: Could Less Be More? SFU Harbour Centre April 23, 2004

The focus of the 7th Annual Changing the Culture Conference was school mathematics curriculum, and students' preparation for university courses, including Calculus and Mathematics for Elementary School Teachers.

The Keynote Lecture, *Lessons from the Ontario Curriculum*, was given by Stewart Craven (District-wide Coordinator of Mathematics and Numeracy, Toronto District School Board). The public lecture, *A Community of Learners: Preparing Students for University and for Life*, was given by Elaine Simmt (Faculty of Education, U of A). The panel discussion was entitled *Reflections on Schools Mathematics Curriculum*.



SIMUW 2004: The Summer Institute for Mathematics University of Washington, June 20–31, 2004



The SIMUW 2004 programme brought together twenty-four students from Washington, British Columbia, Oregon, Idaho, and Alaska. The students had a background of at least three years of high school mathematics but had not yet completed high school. Admission was competitive, based on an assessment both of ability in mathematics and enthusiasm for an intensive mathematical experience. Many students stayed in UW residence halls.

The SIMUW programme was organized by four UW faculty members: Ron Irving, Sándor Kovács, James Morrow, and Paul LePore. Six mathematicians from UW, Microsoft, and the University of Chicago served as the instructors. In addition, another eight mathematicians and scientists from UW and elsewhere participated as special lecturers.



Participants in SIMUW 2003

The programme was divided into two-week blocks, with two instructors for each block. During four of the five weekdays of each week, the students met with one of the instructors in a morning session and the other instructor in an afternoon session. During these sessions, students grappled with mathematical problems that are designed to be challenging yet ultimately accessible. The instructors lectured to a limited extent, in order to provide necessary background, but the emphasis was on giving the students the opportunity to tackle hard mathematical problems in collaboration with the staff.

A special programme was arranged for the remaining weekday of each week. In the morning, a speaker from the campus or the region discussed the role mathematics plays in his or her work. The afternoon session either featured a second speaker or consisted of a special activity or field trip related to mathematics.

For more information please see <http://www.math.washington.edu/~simuw/>.

31st BC Colleges High School Mathematics Contest University College of the Cariboo, Kamloops BC May 7, 2004

Contributed by Rick Brewster, University College of the Cariboo

The BC Colleges High School Mathematics Contest was a great success again this year. The enrichment talk was given by Frank Ruskey (UVic). His talk was well received by the students, and his “Venn knot” was a great design for the T-shirts. During the morning session with Frank, UCC faculty and high school teachers enjoyed a great discussion on teaching mathematics and the transition from high school to university.

While the contest was being held at UCC, one of the UCC faculty members, Jim Totten, who has been a driving force behind this contest for many years, travelled to Northwest Community College in Prince Rupert. There he assisted Mona Izumi with hosting the contest for the first time in Prince Rupert. Mona is the sole mathematician at NWCC in Prince Rupert, making it difficult for her to launch the contest in Prince Rupert. The students in Prince Rupert enjoyed Jim's collection of mathematical puzzles and games.

The BC Colleges' High School Mathematics Contest has always been about participation and not competition. In this respect it is a wonderful mathematics outreach activity.



At the BC Colleges High School
Mathematics Contest

JUMP Comes to PIMS

Junior Undiscovered Math Prodigies (JUMP) is a volunteer based charitable organisation that was founded by John Mighton in 1998. Its purpose is to provide free tutoring in mathematics to elementary students, especially those of disadvantaged background. Over the past five years, John Mighton has observed many surprising improvements in mathematical aptitude in students enrolled in JUMP, particularly in students with severe learning disabilities.



John Mighton
(JUMP)

On April 26, 2004 John Mighton gave a public talk at UBC: *The Myth of Ability: Nurturing Mathematical Talent in Every Child*. He spoke about the method of instruction used in JUMP and about why he thinks the method works with students who have traditionally struggled with math. This talk will soon be available on the PIMS website in Realvideo format.

On July 29, 2004 John returned to PIMS-UBC to give a follow-up session that covered the JUMP methodology with specific examples from the new workbooks. He also spoke about how one could go about implementing the programme.

John Mighton is a mathematician and a Governor General's Award-winning playwright.

For more information about JUMP please see <http://www.jumptutoring.org/>.

PIMS is planning future collaborations with JUMP.





*Southern Gulf Islands, British Columbia
Pender Island in the foreground
Photo by Manfred Trummer*

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The new PIMS logo sets the pi symbol in a landscape of mountains and ocean portraying the scenery of Western Canada and the Pacific Coast, home to the PIMS universities and BIRS. This logo was designed by David MacEntee of MacEntee Creative.

Based on the new logo, the editors changed the look of the PIMS newsletter with a new graphic design and layout.



*Sunset, Lesser Slave Lake Provincial Park
Photo Courtesy of Travel Alberta*

Newsletter Editors: Heather Jenkins, Stefanie Krzak and Manfred Trummer.
Editorial Assistant: Margaret Gardiner
 This newsletter is available on the web at www.pims.math.ca/publications/.

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