PIMS SCIENTIFIC PERSONNEL

PIMS Personnel: 2000/2001

PIMS Main Office

Dr. Nassif Ghoussoub, Director

Dr. Sandy Rutherford, Scientific Executive Officer

Dr. Klaus Hoechsmann, Education Officer

Mrs. Katrina Soh, Assistant to the Director

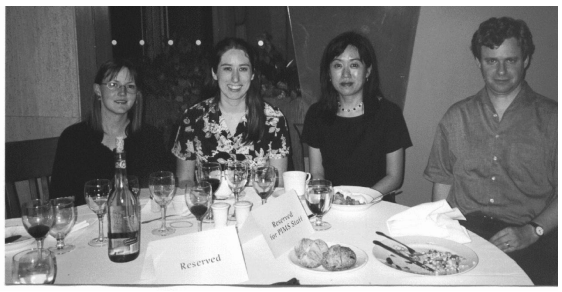
Mr. Shervin Teymouri, Computer Systems Administrator

Mr. Kelly Choo, Website Administrator

Ms. Jacquie Burian, Programme coordinator

Ms. Heather Jenkins, Communications Officer

Ms. Clarina Chan, MITACS Administrator



(from left to right) Heather Jenkins, Jacquie Burian, Katrina Soh and Sandy Rutherford.

PIMS at University of Alberta

Dr. Bryant Moodie, Site Director

Ms. Lina Wang, Executive Assistant

Ms. Martine Bareil, Administrative Assistant

Dr. Ted Lewis, Education Coordinator

Dr. Ruisheng Li, Industrial PDF

Dr. David Lyder, Industrial PDF

Dr. Benjamin Klopsch, PDF

Dr. Matthias Neufang, PDF

Dr. Yoji Yoshii, PDF

Dr. Hongwei Long, Industrial Collaborative Associate

Dr. Wei Sun, Industrial Collaborative

Dr. Long Hongwei, MITACS-PDF

Dr. Sinha Sanjoy, MITACS-PDF Associate

Bryant Moodie, U. Alberta-PIMS Site Director, 1998-2001.

PIMS at Univ. of British Columbia

Dr. Dale Rolfsen, Site Director

Ms. Leslie MacFadden, Administrative Assistant

Dr. Krisztina Vasarhelyi, Education Coordinator

Dr. Siva Athreya, PDF

Dr. Ji-Quang Bao, PDF

Dr. Antal Jarai, PDF

Dr. Luis Lehner, PDF

Dr. Arian Novruzi, PDF

Dr. Sumati Surya, PDF

Dr. Yuqing Wang, PDF

Dr. Bert Wiest, PDF

Dr. Konstantin Zarembo, PDF

Dr. Alexandra Chavez-Ross, Industrial PDF

Dr. Yuri Gusev, MITACS PDF

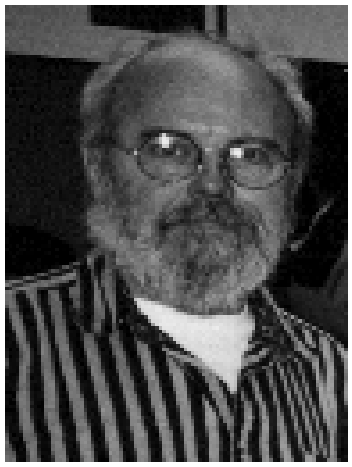
Dr. Simon MacNair, MITACS PDF

Dr. Arian Novruzi, MITACS PDF

Dr. Athan Spiros, MITACS PDF

Dr. Liqing Yan, MITACS PDF

Dr. Xue-Wu Zhang, MITACS PDF



Dale Rolfsen,
UBC-PIMS Site
Director,
1997-2001.

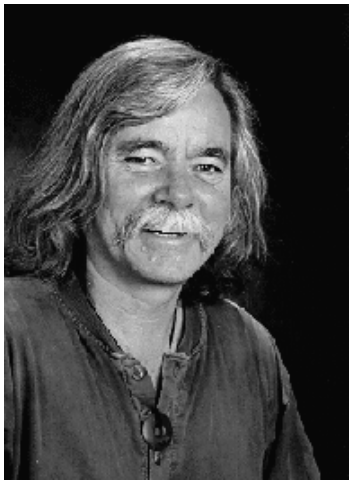
PIMS at University of Calgary

Dr. Michael Lamoureux, Site Director
Mr. Marc Paulhus, Industrial facilitator
Ms. Marian Miles, Administrative Assistant
Dr. Indy Lagu, Education Coordinator
Dr. Mike Powojowski, PDF
Dr. Wai-Shen Cheung, PDF
Dr. Xia Y., MITACS-PDF
Dr. Yao Zhengsheng, MITACS-PDF
Dr. Sadeghi A., MITACS-PDF
Dr. Pen Y., MITACS-PDF
Dr. Gibson Peter, MITACS-PDF

Michael
Lamoureux,
U. Calgary-PIMS
Site Director,
1998-2001.

PIMS at Simon Fraser University

Dr. Bob Russell, Site Director
Ms. Fuyuko Kitazawa, Administrative Assistant
Ms. Andrea Kiefner, PIMS/MITACS Receptionist
Mr. Brent Kearney, Computer Systems Administrator
Dr. Malgorzata Dubiel, Education Coordinator
Dr. Nils Bruin, PDF
Dr. Ricardo Carretero, PDF
Dr. Will Galway, PDF
Dr. Nicolas Robidoux, PDF
Dr. Ladislav Stacho, PDF
Dr. Peter Berg, MITACS PDF
Dr. Radu Bradean, MITACS PDF
Dr. Ronald Ferguson, MITACS PDF
Dr. Ales Janez, PIMS-MITACS PDF
Dr. Cao Jun, MITACS PDF
Dr. Cheb-Terrab Edgardo, MITACS PDF
Dr. Stevens Brett, PIMS-MITACS PDF



Bob Russell,
SFU-PIMS Site
Director,
2000-01.

PIMS at University of Victoria

Dr. Florin Diacu, Site Director
Mrs. Irena Gavrilova, Admin. Assistant

Dr. David Leeming, Education Coordinator
Mr. Kelly Choo, Web Manager
Dr. Hongtu Zhu, Industrial PDF
Dr. Sam Lightwood, PDF
Dr. Sujin Shin, PDF
Dr. Joachim Stadel, PDF
Dr. Gengsheng Qin, PDF
Dr. Julien Arino, MITACS PDF
Dr. Desharnais Josee, MITACS PDF
Dr. Wenpin Jiao, MITACS PDF

Florin Diacu, U. Victoria-PIMS Site Director, 1998-2001.

PIMS University of Washington

Dr. Tatiana Toro, Site Director
Mrs. Mary Sheetz, Administrative Assistant

Tatiana Toro, U. Washington-PIMS Site Director, 2000-01.

PIMS Distinguished Chairs

PIMS has recently established a program of Distinguished Chairs, which serves to host emminent researchers in the mathematical sciences for extended visits at the PIMS sites. The researchers will have the opportunity to collaborate with colleagues at the PIMS universities and to give a series of lectures on their work.

PIMS Distinguished Chairs for 2000/2001

Yuri Matiyasevich (Steklov Institute of Math)
Site: University of Calagry
February–March, 2000

Herbert S. Wilf (University of Pennsylvania)
Site: University of Victoria
June 2000

Stephen Donkin (University of London)
Site: University of Alberta
July, 2000

David Brydges (University of Virginia)
Site: University of British Columbia
Sept. 1 to Oct. 15, 2000

Yuri Matiyasevich

Yuri Matiyasevich is a distinguished logician and mathematician who is known for his outstanding research in logic, number theory and the theory of computer algorithms. One of his most famous results is the definitive solution to the tenth problem posed by mathematician David Hilbert at the 1900 International Congress of Mathematics,

concerning the solution of certain polynomial equations. This, and related results, are fundamental to basic questions in modern computation on digital computers. Prof. Matiyasevich gave a series of six lectures that were attended to capacity by reserarchers and students in mathematics, statistics, and computer science. These lectures were video-taped, and are available on the web for viewing. Also, lecture notes are being prepared for publication.

Herbert S. Wilf, Thomas A. Scott Professor of Mathematics at the University of Pennsylvania, is well-known for his research in Combinatorics. He received the Leroy J. Steele Prize of the American Mathematical Society in 1998 (jointly with Doron Zeilberger) for Seminal Contributions to Research.

During his tenure as PIMS Distinguish Chair at the University of Victoria, he gave two series of lectures on Integer Partitions. The first provided a review of the classical theory of integer partitions and the second investigated recent developments in unified machinery for partition bijections.

David Brydges is the Commonwealth Professor at the University of Virginia. He has made numerous significant contributions to mathematical physics in the areas of quantum field theory and statistical mechanics.

During his visit he delivered four lectures about his recent work on applying rigorous renormalization group methods to the four-dimensional self-avoiding walk problem. The motivating problem was to determine the end-to-end distance of a very long self-avoiding walk on a four-dimensional cubic lattice as a function of the number of steps, n. It is conjectured that the end-to-end distance is a constant times $n^{\frac{1}{2}} \log^{\frac{1}{8}} n$. In the talks, this conjecture was used as pedagogical device to relate some of the standard machinery used in theoretical physics to ideas that are familiar and attractive to mathematicians.

David Brydges

Herbert S. Wilf poses in front of his plane, in which he flew to Victoria with his wife Ruth Wilf. On the left is Brendan McKay (Australian National University).

In the first lecture, *Self Avoiding Walk and Differential Forms*, Prof. Brydges reviewed the continuous time simple random walk on a finite lattice. He demonstrated how the self-avoiding walk problem can in principle be solved as an extension of "Laplace's Method" that has been developed by physicists. The second lecture, *Mehler's Formula and the Renormalization Group,* introduced an improved method for evaluating the integrals introduced in lecture one using a generalization of "Mehler's Formula." This generalization is known as the "Renormalization Group" in the mathematical physics and theoretical physics literature. The third lecture, *Hierarchical Lattices and the Renormalization Group Revisited,* introduced an approximation of the original "Hierarchical Lattice." The main advantage of this is that implementation of the Renormalization Group method becomes much simpler. The log corrections in the four-dimensional end-to-end distance formula was also explained in the context of the Hierarchical Approximation. The final lecture, *Analysis with the Renormalization Group and Outlook,* investigated how the remainder after perturbation theory can be controlled for hierarchical lattices.

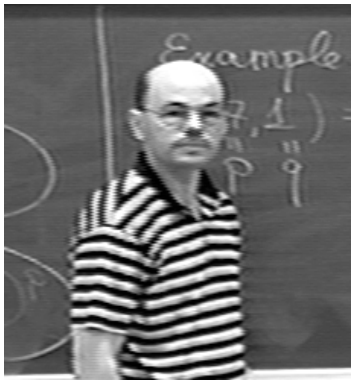
PIMS Distinguished Chairs for 2001/2002

Vladimir Turaev (CNRS Strasbourg VI)
Site: University of Calagry
July–August, 2001

Gang Tian (MIT)
Site: University of British Columbia
August 2001

Michael Shelly (Courant Institute)
Site: Simon Fraser University
October 2001

Vladimir Turaev (Research Director, CNRS IV, Strasbourg) was the PIMS Distinguished Chair at the University of Calgary for the months of July and August 2001 where he gave a series of 6 lectures on *Torsion Invariants of 3-manifolds.*



Vladimir Turaev

Turaev has made several seminal contributions to quantum invariants of 3-manifolds and topological quantum field theory. His recent research has been motivated by the development of topological quantum field theory by Edward Witten in 1988. Witten used the Feynman path integral in his construction, even though there is no rigorous mathematical justification for the path integral in this context. Following the publication of Witten's work, Turaev and Reshetikhin proved that a system of topological invariants of 3-manifolds could be developed using the representation theory of quantum groups. In their work they exploited a relationship between the representation theory of quantum groups and solutions of the Yang-Baxter equation of statistical mechanics. This allowed them to use the theory of representations of the quantum group $U_q(sl_2(\mathbb{C}))$ to define invariants of 3-manifolds. They then went on to give a rigorous construction of a topological quantum field theory in dimension 3.

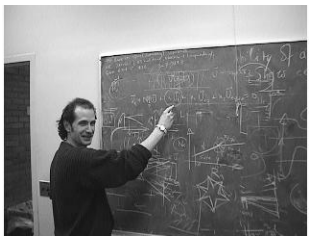
Professor Turaev's work has led to many advances in mathematics and physics. In particular, an understanding of the topological and geometric nature of quantum invariants is viewed by many to be essential for the deveopment of a quantum theory of gravity.

PIMS looked forward to hosting **Gang Tian** as PIMS Distinguished Chair at UBC during the month of August, 2001. Professor Tian is the Simons Professor of Mathematics at MIT. While at UBC, he will lecture on *Recent Progress in Complex Geometry.* He gave 4 lectures in the Geometric PDEs seesion of the PDE Thematic Programme and he also lectured the Canada-China congress.


Gang Tian

Tian's research covers such diverse areas as differential geometry, algebraic geometry, geometric analysis and partial differential equations. He has made fundamental contributions in each of these areas. In particular, he is well known for his work on the question of existence and obstructions for Kähler-Einstein metrics on complex manifolds with positive first Chern class, for his proof that the qantum cohomolgy ring is associative (joint with Y. Ruan) and for his work on higher dimensional gauge theory.

Tian received the 19^{th} Alan Waterman Award from the National Science Foundation in 1994, the Oswald Veblen Prize in 1996 and was an Alfred P. Sloan Research Fellow from 1991–93.


Mike Shelley

Michael Shelly is Professor of Mathematics and Neural Science at the Courant Institute and Co-Director of the Applied Mathematical Laboratory at NYU. He will be giving a series of lectures as a PIMS Distinguished Chair in the month of October at SFU.

PIMS PDFs for 2001/2002 Academic Year

The selection in the 2001/2002 competition was made by Gordon Slade (chair, UBC), Pauline van den Driessche (University of Victoria), Richard Lockhart (SFU), Robert Moody (University of Alberta), Nick Pippenger (UBC) and Rex Westbrook (University of Calgary).

1. **Yuqing Wang**: mathematical biology.
   Supervised by Robert Miura (Math, UBC) and Yue-Xian Li (Math, UBC).
2. **Luis Lehner**: general relativity, numerical relativity and quantum gravity
   Supervised by Bill Unruh (Physics, UBC) and Matt Choptuik (Physics, UBC).
3. **Antal Jarai**: mathematical physics (percolation theory)
   Supervised by Gordon Slade (Math, UBC).
4. **Kazuyuki Furuuchi**: theoretical physics (string theory)
   Supervised by Gordon Semenoff (Physics,UBC).
5. **Joachim Stadel**: numerical astrophysics
   Supervised by Julio Navarro (Physics, UVic) and Arif Babul (Physics, UVic).
6. **Inhyeop Yi**: dynamical systems and operator algebras
   Supervised by Ian Putnam (Math, University of Victoria).
7. **Nils Bruin**: number theory and arithmetic algebraic geometry
   Supervised by Peter Borwein (Math, SFU), David Boyd (Math, UBC), Imen Chen (Math, SFU), Rajiv Gupta (Math, UBC) and Nike Vastal (Math, UBC).
8. **William Galway**: computational number theory
   Supervised by Jonathan Borwein (Math, SFU), Peter Borwein (Math, SFU), Imin Chen (Math, SFU), Stephen Choi (Math, SFU) and Petr Lisonek (Math, SFU).
9. **Sumati Surya**: quantum gravity
   Supervised by Kristin Schleich (Physics, UBC), Don Page (Physics, University of Alberta) and E. Woolgar (Math, UA).
10. **Matthias Neufang**: functional analysis, harmonic analysis and operator algebras
    Supervised by Volker Runde (Math, University of Alberta).
11. **Wen Chen**: signal and image processing
    Supervised by Bin Han (Math, University of Alberta) and Rong-Qing Jia (Math, University of Alberta).
12. **Roman Vershynin**: geometric functional analysis
    Supervised by Nicole Tomczak-Jaegermann (Math, University of Alberta).
13. **Christina Cobbold**: mathematical biology. Supervised by Mark Lewis (Math and Biological Sciences, University of Alberta).
14. **Luigi Santocanale**: computer science and category theory
    Supervised by Robin Cockett (Computer Science, University of Calgary).
15. **Peter Hoyer**: algorithmics, data structures, complexity theory and quantum computing
    Supervised by Richard Cleve (Computer Science, University of Calgary).
16. **Jorgen Rasmussen**: conformal field theory and Kac-Moody algebras
    Supervised by Mark Walton (Physics, University of Lethbridge).

PIMS Industrial PDFs for 2001/2002 Academic Year

The following projects have been supported in 2001/2002.

1. **Denis L. Westphalen**
   Industrial Partner: Hyprotech Ltd.
   Sponsors: Brent Young (Chemical and Petroleum Eng., U. Calgary)
   Project: Design of heat exchanger networks for optimal controllability
2. **Abdul Hannan Chowdhury**
   Industrial Partner: Nortel Networks/StatCaR
   Sponsors: Rita Aggarwala (Math, U. Calgary)
   Project: Analysis of Censored Data for Reliability Improvement under Highly Fractionated Experiments
3. **David Burggraff**
   Industrial Partner: Galdos Systems
   Sponsor: Dennis Sjerve (UBC)
   Project:
4. **Steven Wang**
   Industrial Partner: Insightful
   Sponsors: Ruben Zamar and Raymond Ng (UBC)
   Project: Data mining and robust statistics