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PIMS is supported by

- **The Natural Sciences and Engineering Research Council of Canada**
- **The British Columbia Information, Science and Technology Agency**
- **Alberta Science, Research and Technology Authority**
- **Simon Fraser University, The University of Alberta, The University of British Columbia, The University of Calgary, The University of Victoria, The University of Northern British Columbia, The University of Lethbridge.**

The Canada-China Congress: A Successful First Step

The First Canada-China 3×3 Mathematics Congress was an unqualified success. The Canadian delegation consisted of sixty of the best mathematical scientists in Canada and was accompanied by NSERC's President Tom Brzustowski.

The opening ceremony involved the Presidents of the Universities of Peking, Tsinghua, Nankai and Fudan as well as the head of the math section of the academia Sinica and the vice-president of the NSFC. Dr. T. Brzustowski and Dr. N. Ghousoub spoke on behalf of the Canadian delegation.

*Please see **Canada-China**, page 11.*

Alberta Ministry of Innovation and Science Confirms its Support of PIMS

The Alberta Ministry of Innovation and Science, through its agency the *Alberta Science, Research and Technology Authority* has confirmed its support of the Pacific Institute for Mathematical Sciences through an award of \$800,000 for research projects including industrial collaborations, graduate training, educational activities, and MITACS initiatives.

To reflect Albertans' priorities for the new millennium, the Ministry of Innovation and Science consolidates all of the government's technology, research and scientific activity within one organizational structure under the leadership of Dr. Lorne Taylor. Previously, Dr. Taylor had served as Minister Responsible for Science, Research and Information Technology.

*Please see **Alberta**, page 11.*

Nobel Laureates and Fields Medalists Participate in PIMS Summer Programmes

Both thematic programmes held at PIMS-UBC this summer were a extremely successful. Two Nobel Laureates participated in the Mathematical Biology Thematic Programme, with Professor Michael Smith attending the Workshop on Mathematical Genetics and Professor Andrew Huxley speaking at the Workshop on Mathematical Cell Biology. In honour of Professor Huxley's visit a High Tea was hosted at PIMS.

A number of eminent mathematicians participated in the Miniprogramme in Geometric Functional Analysis, held at PIMS-UBC from June 27 to July 18. Participants included Fields medalists Jean Bourgain (IAS, Princeton) and Timothy Gowers (Cambridge), Wolf Prize winner Mikhael Gromov (IHES and Courant Institute), Salem Prize and Ostrowski Proze winner Gilles Pisier (Université Paris VI and Texas A&M), and Loeve Prize winner Michel Talagrand (Ohio State University).

Both of these thematic programmes made full use of the expanded PIMS facilities at UBC. The workshops in Mathematical

*Please see **Summer Programmes**, page 12.*

Director's Notes

David Boyd, FRSC
Acting Director

Sitting in for Nassif during his leave of absence has been an interesting experience. One of the first things that struck me is the wide variety of activities and programmes which are being conducted at the institute.

The highlights of this past summer were the Thematic Programme in Mathematical Biology and the Miniprogramme in Geometric Functional Analysis. I would like to thank the scientific organizers of these events for their hard work in organizing these highly successful workshops. Nicole Tomczak Jaegermann (University of Alberta) and Vitali Milman (University of Tel Aviv) put together an outstanding programme of lectures for the Mini-Programme on Geometric Functional Analysis. I would also like to express my appreciation to the organizers of the Thematic Programme in Mathematical Biology for their efforts in organizing this huge endeavour, which consisted of 5 two-week workshops running from May 31 to August 27. The Workshop on Mathematical Genomics was organized by David Sankoff (CRM) and Michael Waterman (University of Southern California). The Workshop on Mathematical Physiology was organized by Robert Muira (UBC), Yue-Xian Li (UBC) and Gerda de Vries (University of Alberta). The Workshop on Mathematical Epidemiology was organized by Pauline van den Driessche (UVic) and Fred Brauer (UBC). The Workshop on Mathematical Ecology was organized by Marc Mangel (University of California, Santa Cruz). The Workshop on Mathematical Cellular Biology was organized by Leah Keshet (UBC). The overall coordination of the five workshops was ably overseen by Robert Muira (UBC).

At PIMS we are already hard at work on next summer's thematic activities. As the PIMS part of the Fields-PIMS Thematic Year on Graph Theory and Combinatorial Optimization, five workshops are being organized, to be held at UBC, UVic and SFU from May 29 until July 29. More complete details on these may be found on page 7 of this Newsletter.

The PIMS Thematic Programme in Algebra will be held next summer at The University of Alberta from June 19 until July 14. This Programme will have a unique format consisting of a mix of overlapping instructional courses and research-level workshops over a four week period in areas as diverse as Lie Theory, Group and Representation Theory and the Mathematics of Aperiodic Order. This format is designed to attract a broad spectrum of participants, from graduate students and PhDs to senior researchers in the field. More complete details may be found on page 8 of this Newsletter.

As a final note, I would like to express my congratulations to Arvind Gupta for his recent appointment as MITACS Programme Leader. Arvind has been actively involved in PIMS and MITACS since their inception. His hard work on behalf of MITACS and PIMS is known to everyone.

PIMS Director's Address to Canada-China Math Congress

PIMS Director, Nassif Ghoussoub, gave the opening address at the recent Canada-China 3×3 Math Congress in Beijing. The text of his address is reprinted below.

Dear Chinese and Canadian colleagues; Dear senior officials who honour us with your presence.

When the International Mathematical Union selected Beijing as the site for the next International Congress of Mathematicians in 2002, it was a clear recognition from the world mathematical community of the current status of China as a strong world leader in our favourite discipline. Canada was of course there to advocate and support that choice.

Before that, the Canada-China 3×3 project had been initiated by the Presidents of 6 Chinese and Canadian Universities. Its main goal is to establish continuing collaborations in a number of research areas where there is corresponding strength in the 2 communities. Mathematics was clearly one of them and this congress is meant to do just that. To provide a forum for a wide consultation on future joint projects and collaborations in the mathematical sciences: pure or applied, abstract or industrial, conceptual or computational, technological or traditional. How to do it, how to teach it, how to communicate it and how to use it.

Initiating such a large scale initiative requires effort and commitment from many people. We thank you Professors Chang, Professor Peng and Professor Cai and of course your graduate students; It requires the support of many officials and we thank the Natural National Science Foundation of China as well as the Presidents of the universities of Beijing, Nankai, Tsinghua and Fudan for your personal and unwavering support.

The Canadian delegation has also another special reason to enjoy this event as it finds the presence of Thomas Brzustowski here, particularly gratifying. Tom started his term as President of the Natural Science and Engineering Research Council of Canada at a time when the Canadian mathematical community was at a cross-road and was doing lots of soul-searching. Very early on, Tom Brzustowski saw the importance of the moment and unfazed by risk or political considerations, he managed to find and give the mathematical community this little bit of space, this little margin to allow it to collectively, experiment, innovate, restructure and grow. He then dared us to succeed. The result has been one of the success stories of Canadian Science and also of the Canadian granting system. In many ways, our community is here because of you Tom and we thank you for that.

Finally, in the name of the Canadian delegation, let me say to our Chinese hosts that we are grateful for the opportunity to be your partners, we are thankful for the substantial organizational effort and—in spite of the jetlag—we are delighted to be here.

Call for Nominations:

PIMS Research Prize

In keeping with the PIMS mandate to promote research in the mathematical sciences, PIMS has created a prize to recognize outstanding contributions to research in the mathematical sciences. This prize will be given for a particular outstanding contribution to the mathematical sciences that was published during the past five years. This award is designed specifically to recognize major current research initiatives rather than being an award for lifetime achievement.

This prize is open to Canadian citizens, permanent residents of Canada and residents of Pacific Rim countries who maintain academic ties to the Canadian mathematical sciences community. Nomination must be by three sponsors who should provide a cover letter explaining the nominee's contribution, impact and relevance for the prize, a CV of the nominee, a publication list and reprints of the nominee's relevant publications. The value of the prize is \$3000.

Nominations for the prize must be submitted by **January 21, 2000** to:

Attn: PIMS Research Prize
Pacific Institute for the Mathematical Sciences
Rooms 200–220, West Mall Annex
1933 West Mall
University of British Columbia
Vancouver, BC V6T 1Z2

Enquiries should be directed to Sandy Rutherford (<sandy@pims.math.ca>), PIMS Scientific Executive Officer.

IAM-PIMS Workshop in Industrial Math February 18–20, 2000 University of British Columbia

This 3-day workshop is aimed at senior undergraduates. Faculty mentors will first outline industrial problems to all of the students, who will then have the option to choose one or more problems to work on during the workshop. Lectures on each of the problems will be presented by the mentors, in which the tools for modeling an analysis of the problem will be developed. The mentors will then help the students develop models and try to answer the questions posed. The workshop will culminate with a brief presentation by the working groups on their results. The mathematical tools used in the workshop will be accessible to 3rd and 4th year undergraduates in mathematics, applied mathematics, physics and applied science.

This workshop is sponsored by PIMS and the Institute for Applied Mathematics (IAM) at UBC. If you are interested in participating in the workshop, please contact us at IAM-PIMS senior undergraduate industrial math workshop, The Institute for Applied Mathematics, The University of British Columbia, Room 311, 6356 Agriculture Road, Vancouver, BC V6T 1Z2. The email address is iam@iam.ubc.ca.

Call for Nominations:

PIMS Postdoctoral Fellowships

The Pacific Institute for the Mathematical Sciences invites applications for Postdoctoral Fellowships in the mathematical sciences. Applicants must be nominated by a Department (or Departments) affiliated with PIMS, or scientist(s) affiliated with PIMS. The fellowships are intended to supplement support made available through the sponsor.

The institute expects to make up to 20 awards tenable at any of its five founding universities (Simon Fraser University, the University of Alberta, the University of British Columbia, the University of Calgary and the University of Victoria) or at one of the two affiliated universities (University of Northern British Columbia and University of Lethbridge).

The amount of the award is \$18,000 and the sponsor is required to obtain additional funds to finance a minimum stipend of \$35,000 (including benefits). Award decisions will be made by the PIMS Scientific Review Panel based on excellence of the candidate, potential for participation in PIMS programs and potential for involvement with PIMS partners. PIMS Postdoctoral Fellows will be expected to participate in all PIMS activities related to the Fellow's area of expertise and will be encouraged to spend time at other sites.

Nominations should include curriculum vitae, statement of research interests, three letters of reference (including one from a sponsoring scientist), and a statement of anticipated support from the sponsor. Nominations must be submitted by **February 11, 2000** to:

Attn: PIMS PDF Competition
Pacific Institute for the Mathematical Sciences
Rooms 200–220, West Mall Annex
1933 West Mall
University of British Columbia
Vancouver, BC V6T 1Z2

For more information and complete eligibility rules, see the webpage www.pims.math.ca/opportunities/pdf.html. Enquiries should be directed to Sandy Rutherford (<sandy@pims.math.ca>), PIMS Scientific Executive Officer.

Second Annual PIMS PDF Workshop December 4–5, 1999 PIMS-UBC

The Second Annual PIMS Postdoctoral Fellow Workshop will be held in the new PIMS facilities at UBC. The purpose of this workshop is to bring together PIMS PDFs to discuss their research and exchange ideas. The format of the workshop will consist of one-hour and half-hour colloquium-style talks, in which PDFs will describe their recent results and current research interests.

For more information, please contact Sandy Rutherford (<sandy@pims.math.ca>) or see the webpage www.pims.math.ca/pdf-workshop.

Swedish Royal Technology Mission visits MITACS

A delegation from the Royal Swedish Academy of Engineering Sciences (IVA), including H. M. King Carl XVI Gustaf of Sweden, conducted a site visit to the Mathematics of Information Technology and Complex Systems (MITACS) Network on September 24.

As well as the King, the Swedish Ambassador to Canada, H. E. Mr. Jan Ståhl, and representatives from the Canadian Government were part of the delegation. The Academy was represented by professors and senior administrators, with IVA Chairman Dr. Björn Svedberg, as Chairman of the delegation. Four other Swedish academic institutions also took part: Lund University, Uppsala University, the Karolinska Institute and Chalmers University of Technology. Chalmers University was represented by its President, Professor Jan-Eric Sundgren.

The delegation also included about 20 heads of companies from many sectors of the Swedish economy such as SCA Hygiene Products Senior Vice President Claes-Göran Beckman, Ericsson Components President Sigrun Hjelmquist and AB Volvo Executive Vice-President Arne Wittlöv.

After a breakfast hosted by the University of Toronto, the delegation walked to the Fields Institute, home to the MITACS Head Office. There, they were welcomed by Dr. Don Dawson, MITACS Interim Program Leader and Director of Fields and Dr. Arvind Gupta, representing The Pacific Institute for the Mathematical Sciences. Dr. Dawson and Dr. Gupta, presented a brief scientific overview of MITACS to the delegation.

Following a question and answer period, Dr. Dawson closed the formal part of the event by thanking the King, the Ambassador and the delegation. He invited the delegation to enjoy some refreshments in the Fields Institute Atrium.

At the King's request, Dr. Dawson took him on a personal tour of the Institute. "I was impressed that His Majesty showed a real interest in the work being done in the Institute. He stopped in an office and asked the students what they were working on," says Dawson.

During its week-long visit to Canada, the delegation sought to learn from the experience of Canadian collaborations between industry and academe. As part of the Federal Networks of Centres of Excellence (NCE), MITACS is a prime example of such collaboration in action. Across the country, the MITACS Network consists of 21 research projects, subdivided into five theme areas: Biomedical, Industrial/Commercial, Information Technology, Trading/Finance, and Manufacturing. It brings together private and public sector scientists to work on mathematical problems in key sectors of the Canadian economy.

Another key objective of the mission was to estab-

lish contacts with Canadian academics and industries. Dr. Dawson views the MITACS site visit as an opportunity to make such contacts: "We see real opportunity here to develop collaborative relationships with the organizations represented in the delegation-companies in all five sectors of MITACS research."

Dr. Gupta echoes his sentiments: "We were very pleased. At least five or six of the companies here today were interested in specific MITACS projects and research areas."

Former PIMS Deputy Director Selected as MITACS Program Leader

Arvind Gupta, former deputy director of PIMS and Associate Professor of Computer Science at Simon Fraser University, has recently been selected as the new Program Leader of the MITACS NCE. He will take up his duties at MITACS on November 1, 1999.

Dr. Gupta received his Ph. D. from the University of Toronto in 1991. His thesis advisor was Dr. Steve Cook. After spending one year as an NSERC PDF at the University of Waterloo, he joined the faculty of Simon Fraser University in September, 1991. His main research interests are in the areas of combinatorics, optimization and complexity theory.

Dr. Gupta was one of the founders of PIMS and he served as SFU Site Director and Deputy Director from 1996 until May 1999. He was instrumental in establishing the highly successful PIMS industrial outreach strategy. He was a founder of both the *PIMS Industrial Problem Solving Workshop* and the *PIMS Summer Industrial Graduate Training Camp*. More than 150 academics, students, and industrial scientists annually participate in these two events, which introduce new problems into the academic community, open future possibilities for graduate students, and give the business world a taste of the intellectual capabilities of academia.

Building on the success of the PIMS industrial programs, Dr. Gupta was one of the founders of MITACS and he is currently the Theme Leader for the Industrial/Commercial Theme. When the idea of establishing an NCE in the mathematical sciences was first floated, Dr. Gupta immediately saw the enormous potential for the entire community. MITACS would provide a natural tie between academia and the industrial community and would create a huge number of new opportunities for young scientists both within the network and afterwards.

We wish Dr. Gupta every success in his new endeavour.

MITACS PINTS Centre at the University of Alberta

The MITACS PINTS centre is one of a network of centres of excellence, the MITACS network, founded with core funding from the three granting councils, NSERC, MRC, and SSHRC, as well as cash and in kind contributions from industrial sponsors. PINTS, one of the MITACS centres affiliated with PIMS, stands for Prediction in INteracting Systems, and the purpose of this centre is to provide mathematical research into realistic and computer tractable prediction and tracking strategies. These strategies will allow the feasible classification and tracking of multiple interacting targets based upon distorted, corrupted, partial observations. Practical applications abound in search and rescue, air traffic management, narcotic smuggling prevention, and military industries. The development of these methods will require advances in the mathematics of measure-valued stochastic processes and nonlinear filtering theory.

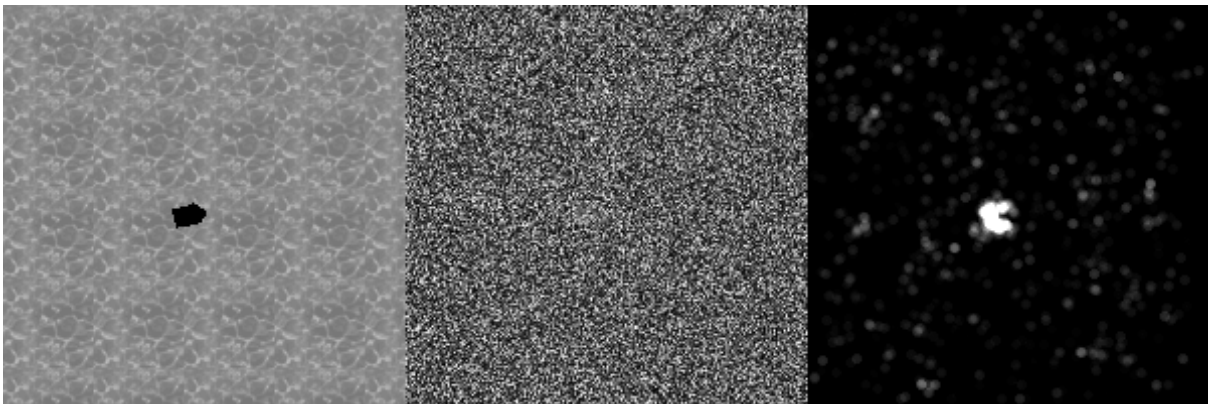
Research conducted at PINTS has a number of benefits for a variety of parties. The first is knowledge transfer: applicable advances in research are communicated to industry through our industry sponsors. Secondly, the work at the centre acts to draw students into mathematical studies who might otherwise not take on this opportunity. Most importantly, the facility provides an environment for pursuing competition-enhancing Canadian research.

In the six months since the centre has opened, a number of projects have been completed. Most involve a search and rescue application that has been formulated as a tracking problem. A number of particle filtering methods have been implemented to solve this problem and a new particle method has been introduced. Quantitative comparisons among these methods have been conducted. Also, an exact convolution nonlinear filter has been devised and implemented to solve low-dimension problems. This exact filter has applications in air traffic management and stock tracking.

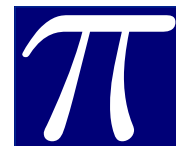
The centre is headed by Dr. Michael Kouritzin of the University of Alberta, and includes members from universities across Canada, the United States, and one in France. Currently the centre hosts three post-docs, Hongwei Long, Ruisheng Li, and Eric Durbez, and two others plan to start shortly. Paul Wiebe and David Ballantyne are graduate students studying at the centre, with two others on the way. Andrew Kobos works as a programmer and Hubert Chan is a summer student with PINTS. Industry partners include Lockheed Martin Canada, Lockheed Martin Tactical Defense Systems from Minnesota, and VisionSmart of Edmonton.

A number of successful conferences and events have been hosted by the centre or attended by members of the centre. In February, the centre was inaugurated with a kick-off meeting which drew attendees with a variety of backgrounds and expertise to discuss the problems to be investigated. Keynote speakers were Tom Kurtz, Craig Poling, Pierre Valin, and Zach Florence. Pierre Del Moral, a distinguished French mathematician in the field of particle approximations to nonlinear filtering, visited the centre in April to lecture on these methods and to discuss improvements. During the early part of the summer, Douglas Blount was at the centre collaborating on a branching particle filter scheme. An open house was held in June to display the first results of particle filtering implementations. As well, PINTS members brought the results of the particle filter comparisons to a workshop on nonlinear filtering held in Madison, Wisconsin, and to a meetings at Lockheed Martin sites in both Minnesota and Montreal. These results were met with great interest by both mathematicians and applied scientists.

Forthcoming work at PINTS will focus on multiple target tracking, pollution tracking models, and target identification. For more information visit the webpage <http://www.math.ualberta.ca/pints>.



A signal process (left) undergoes a noisy, corrupting observation process (middle), but is still tracked by the particle filter (right).



Thematic Year on Graph Theory and Combinatorial Optimization

August 1999 – July 2000

This thematic programme is co-sponsored by the Pacific Institute for the Mathematical Sciences and the Fields Institute for Research in the Mathematical Sciences. The lead off events were *The Workshop on Algorithms and Data Structures*, held at SFU Harbour Centre, August 11–14, 1999 and the 11th *Canadian Conference on Computational Geometry*, held at UBC, August 15–18, 1999. During the winter of 1999–2000, the thematic year activities will take place at the Fields Institute.

Fields Institute Activities

Workshop on Approximation Algorithms For Hard Problems In Combinatorial Optimization

September 26 – October 1, 1999
Fields Institute

Organizing Committee: Joseph Cheriyan (University of Waterloo), Michel Goemans (University of Louvain and MIT), and David Shmoys (Cornell University)

Workshop on Probabilistic Graph Theory

February 14–19, 1999
Fields Institute

Organizing Committee: Joseph Cheriyan (University of Waterloo), Alan Frieze (Carnegie Mellon University), and Mike Molloy (University of Toronto)

Workshop on Polyhedral and Semidefinite Programming Methods In Combinatorial Optimization

November 1–6, 1999
Fields Institute

Organizing Committee: W. H. Cunningham (University of Waterloo), W. R. Pulleyblank (IBM Watson Research, New York), A. Schrijver (CWI, Amsterdam), and L. Tuncel (University of Waterloo)

Workshop on Structured Families of Graphs

May 8–13, 1999
Fields Institute

Organizing Committee: Derek Corneil (University of Toronto) Jerry Spinrad (Vanderbilt University), and Lorna Stewart (University of Alberta)

Workshop on Matroids, Matching, and Extensions

December 6–11, 1999
University of Waterloo

Organizing Committee: W. H. Cunningham (University of Waterloo), A. Frank (Eötvös University, Budapest), J. F. Geelen (University of Waterloo), and A. Sebö (CNRS, Grenoble)

Coxeter Lecture Series on Geometric Representations of Graphs

László Lovász (Microsoft Research)

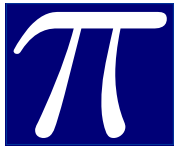
Geometric Representations and Graph Properties at 18:00–19:00, November 1, 1999

Orthogonal Representations and Semidefinite Optimization at 16:00–17:00, November 2, 1999

Colin de Verdiere's Invariant at 16:00–17:00, November 3, 1999

All lectures will be held at the Fields Institute.

In conjunction with the Thematic Year activities the Fields Institute, two graduate courses will be offered in Fall, 1999 and two graduate courses will be offered in Spring, 2000. For more information on the Fields Institute Activities, please see <http://www.fields.utoronto.ca/graphtheory.html>.



Summer 2000 Thematic Workshops at PIMS



Interconnection Networks

May 29 – June 2 at The University of British Columbia

Organizer: Nick Pippenger (University of British Columbia)

The theory of interconnection networks applies graph theory and other areas of discrete mathematics to communications problems. The theory has expanded from its original focus on circuit-switching networks for voice telephone traffic to include packet-switching networks for digital information and networks used within parallel computers for communication among processors. It has also expanded from its original focus on probabilistic models for traffic and performance (it was the birthplace of queueing theory) to include networks providing a rich variety of combinatorial properties relevant to communication and computation. This workshop will provide a forum to survey the progress made in recent decades, and to envision the avenues for further progress in the future.

Dynamic Graph Problems

June 4–10 at The University of Victoria

Organizer: Valerie King (University of Victoria)

For any graph problem, we may ask: if a graph instance undergoes an on-line sequence of updates, can one make use of previous computation to recompute the solution after each update more quickly? The study of dynamic graph problems has recently undergone some dramatic developments. The goal of this workshop is to bring together experts on various topics in the area with interested students and researchers, to discuss the current state of the field, identify promising directions for research, and do some problem-solving. Topics include: proving lower bounds, problems in computational geometry, new and old problems for undirected and for directed graphs, problems on trees, and applications to networks, data bases and programming languages.

Graph Decompositions

June 18 – July 1 at Simon Fraser University

Organizer: Brian Alspach (Simon Fraser University)

The workshop will consist of a series of invited instructional lectures whose purpose is to survey the current status of a variety of important graph decomposition problems. The workshop will deal only with edge decomposition problems. Some time slots will be kept open for participants to provide complementary talks or responses to the invited lectures. Some of the topics which will be covered include: Cycle double cover conjecture, cycle decompositions, Gyrfas-Lehel conjecture, isomorphic factorizations, ascending subgraph decomposition, algorithmic aspects of edge decompositions, Hamilton decompositions, and orthogonal factorizations.

Flows, Cycles, and Orientations

July 2–14 at Simon Fraser University

Organizer: Luis Goddyn (Simon Fraser University)

This workshop presents an opportunity for participants to identify and work collaboratively on current problems in graph/matroid theory which broadly fall into the above three categories. Topics may concern algorithmic, polyhedral, algebraic, probabilistic, or extremal aspects, and may involve embeddings, flow/colouring theory, circuit/bond covers, matroids and connectivity. Evidently the scope intersects those of the two adjacent workshops, so topics will chronologically flow from cycles to colourings.

There will be a series of invited presentations (about two per day) with plenty of time allotted for less formal interaction and some time slots for complementary talks or responses to the invited lectures.

Colourings and Homomorphisms

July 16–29 at Simon Fraser University

Organizer: Pavol Hell (Simon Fraser University)

The workshop will consist of a series of informal lectures highlighting recent developments in generalizations of colourings, including circular colourings, oriented colourings, T-colourings, multicolourings, and, more generally graph homomorphisms. Algorithmic, combinatorial, and algebraic issues will all be discussed, as will applications in and connections to constraint satisfaction problems, scheduling, etc. Generous amounts of time will be reserved for unstructured discussions.

For registration and further information, please visit the website
<http://www.pims.math.ca/graph2000>

PIMS Thematic Programme in Algebra

PIMS at the University of Alberta

June 19 – July 14, 2000

Organized by Akbar Rhemtulla and Robert Moody (University of Alberta), the PIMS Thematic Programme in Algebra consists of 4 weeks of instructional courses and research-level workshops in each of the three broad areas: Lie Theory (Lie groups and algebras), Group Theory & Representations, and the Mathematics of Aperiodic Order. In each area, there will be a one-week instructional school followed by a one-week research-level workshop. The instructional schools are intended for graduate students, post-doctoral fellows, young Ph. D.'s, and exceptional undergraduates. The workshops are aimed at researchers, advanced graduate students, and others familiar with the area. We hope that many participants will choose to attend both the instructional and research components of each area.

Thematic Programme Schedule

June 19–23	June 26–30	July 3–7	July 10–14
Lie Theory School	Lie Theory Workshop Group Theory School	Group Theory Workshop Aperiodic Order School	Aperiodic Order Workshop

Lie Theory

Confirmed Lecturers at the School

A. Pianzola (University of Alberta), *Lie Algebras*
S. Donkin (Queen Mary & Westfield College, London),
Algebraic Groups

Confirmed Participants in the Workshop

Georgia Benkart (University Wisconsin)
Stephen Donkin (Queen Mary & Westfield College, London)
Olivier Mathieu (IRMA, Strasbourg)
K.-H. Neeb (Technische Universität Darmstadt)

Group Theory and Representations

Confirmed Lecturers at the School

Michel Broué (Univ. de Paris VII), *Representations of Groups of Lie Type*
Peter Kropholler (Queen Mary & Westfield College, London),
Cohomological Methods
Dan Segal (Oxford University), *Residually finite groups*
Aner Shalev (Hebrew University, Jerusalem), *Profinite and p-adic analytic groups*

Confirmed Participants in the Workshop

Michel Broué (Université Paris VII)
Steve Gersten (University of Utah)
Rod Gow (Dublin City University)
Peter Kropholler (Queen Mary & Westfield College, London)
A. Lubotzky (Hebrew University, Jerusalem)
A. Yu. Ol'shanskii (Moscow State University)
Geoffrey Robinson (University of Birmingham)
Dan Segal (Oxford University)
Aner Shalev (Hebrew University, Jerusalem)
Alex Turull (University of Florida)

Mathematics of Aperiodic Order

Confirmed Lecturers at the School

M. Baake (Universität Tübingen), *Introduction to aperiodic order, tilings, and diffraction*
J. Lagarias (AT&T Labs), *Discrete geometry and aperiodic point sets*
B. Solomyak (University of Washington), *Dynamical systems and aperiodic order*

Confirmed Participants in the Workshop

Jean-Paul Allouche (CNRS, Orsay)
Michael Baake (Universität Tübingen)
Jean-Pierre Gazeau (Université Paris VII)
Uwe Grimm (Technische Universität Chemnitz)
Petra Gummelt (Universität Greifswald)
Jeff Lagarias (AT&T Labs)
Boris Solomyak (University of Washington)

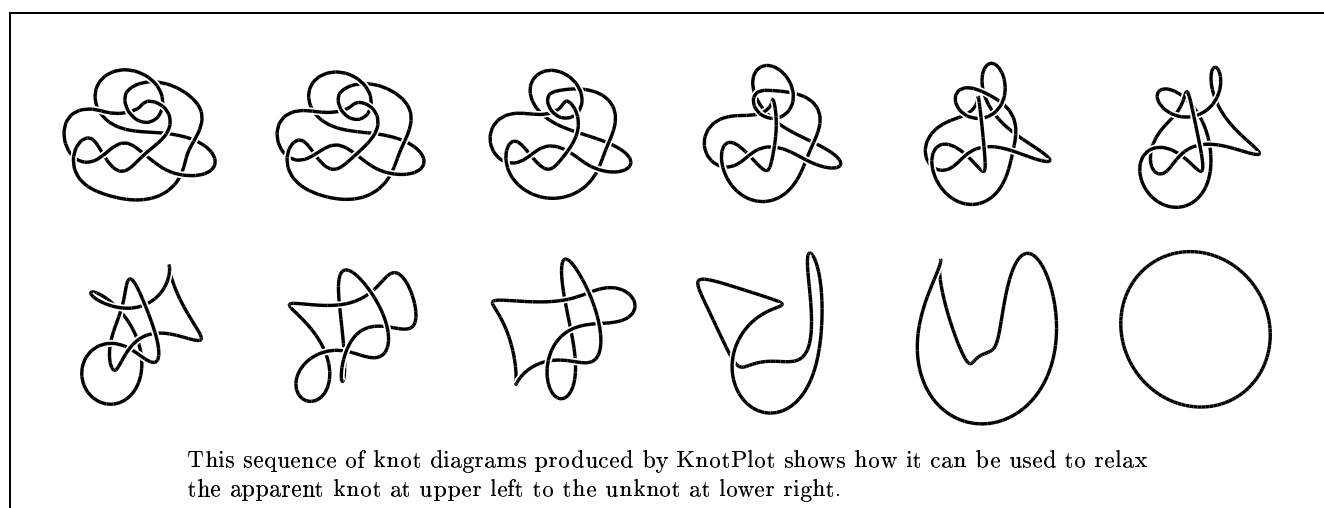
For registration and further information, please visit the website
<http://www.pims.math.ca/algebra2000>

KnotPlot Available for Download from PIMS Website

KnotPlot is an interactive computer program for visualizing and studying knots from a (mostly) mathematical point of view. Originally available only on high-end graphics workstations, KnotPlot has now been ported to a wide variety of computer architectures and should run nicely on most home or lab machines. KnotPlot will appeal to both mathematicians and knot enthusiasts alike.

KnotPlot comes with a large database of knots and links from the standard catalogues as well as many others from classic works on knot-tying such as *The Ashley Book of Knots*. These can be enjoyed interactively in the KnotPlot viewer or exported as illustrations for use in printed publications or on the web. In addition to the database, nearly an unlimited number of knots can be constructed using the powerful tools provided by KnotPlot. One example is the “tangle calculator”, which uses John Conway’s calculus of tangles to construct arbitrary knots. Knots or links can be constructed immediately if they have either a Dowker code or braid word description, or if they belong to one of the special families of knots (such as the torus and Lissajous knots). If all these aren’t enough, any particular embedding of a knot can be sketched directly in 3D using the mouse.

After a knot is created in KnotPlot, it can be modified in several different ways. One of the most interesting of these is the ability to “relax” a knot to a simpler form using simulated force laws. This can often be a powerful method to untangle initial configurations or to find interesting symmetries of a knot. It is this feature (and several others) that make KnotPlot a useful tool in knot theory research.

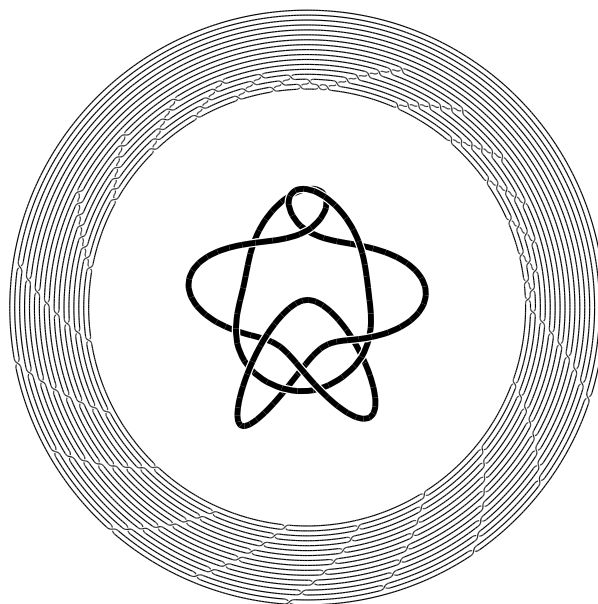


Finally, KnotPlot can produce output in many different forms, from simple line drawing figures to fancy coloured graphics. These can be readily imported into most text editing software for production quality results. Be sure to check the web address below to see examples. If you just need a simple way to draw nice knot diagrams, KnotPlot is the tool for you.

KnotPlot is now available for Windows 98/NT, Linux, Sun Solaris, Silicon Graphics IRIX, and Macintosh. To run it, you need to have OpenGL(TM) installed on your machine. OpenGL (www.opengl.org) already exists on many different computer platforms, you already have it if you have a Windows 98/NT or Macintosh system (version 8.6).

KnotPlot was written by Rob Scharein. Development was supported by PIMS and MAGIC (The Media and Graphics Interdisciplinary Centre) at UBC.

Executables and installation instructions for KnotPlot may be downloaded from <http://www.pims.math.ca/knotplot>.



The complicated braid on the outside has been relaxed by KnotPlot to the knot in the centre.

Report on the 1st Canadian Conference on Nonlinear Solid Mechanics

E. Croitoro

Dept. of Mathematics and Statistics
University of Victoria

The University of Victoria initiated and hosted the first-ever Canadian Conference on Nonlinear Solid Mechanics, from June 16 to June 20, 1999. The Conference was a very successful international meeting with the participation of many of the most distinguished researchers. World leaders in the field honoured, with both their contributions and their presence, the 1st Canadian Conference on Nonlinear Solid Mechanics.

Plenary Speakers:

A. J. M. Spencer (University of Nottingham, UK)
M. Hayes (University College Dublin, Ireland)
T. Belytschko (Northwestern University, USA)
R. W. Ogden (University of Glasgow, Scotland)
M. S. Gadala (University of British Columbia, Canada)

Mini-Symposia Organizers:

C. O. Horgan (Univ. of Virginia Charlottesville, USA)
Debra P. Warne (Univ. of Tennessee Knoxville, USA)
Carlos Garcia Garino (National Univ. of Cuya, Mendoza, Argentina)
M. Hayes (University College Dublin, Ireland)
A. D. Drozdov (Institute for Industrial Mathematics, Beersheba, Israel)
M. S. Gadala (University of British Columbia, Canada)
M. Epstein (University of Calgary, Canada)
M. A. Slawinski (University of Calgary, Canada)
Peter Schiavone (University of Alberta, Canada)

The two Proceedings volumes (ISBN 1550581953) contain the edited version of the papers presented at the Conference including Plenary Lectures, invited presentations within Mini-Symposia and Contributed papers — 147 authors from 24 countries and 5 continents.

The response from the research community was extremely positive commending the excellence of the authors, the high level of presentations, the format of the conference, and the organisation of the technical and social programme.

The Organising Committee and the International Technical Committee would like to thank the Pacific Institute for the Mathematical Sciences, the University of Victoria, the Department of Mechanical Engineering at the University of British Columbia, Royal Roads University, and the BC Advanced Systems Institute for their generous support. We would also like to express our warm gratitude to the many people who assisted with the organisation of the Conference and made the 1st Canadian Conference on Nonlinear Solid Mechanics a very successful scientific event.

The 2nd CanCNSM will take place in 2001 in Vancouver and it will be organised by Professor M. S. Gadala of the University of British Columbia.

Report on the PIMS-UCalgary Workshop on the Invariants of 3-Manifolds

J. Bryden

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University of Calgary

During the past summer the University of Calgary was the place to be — especially for topologists! There was great excitement with the hosting of a summer research programme on invariants of 3-manifolds, organized by John Bryden, David Hobill and Peter Zvengrowski. The principal visitors were Vladimir Turaev, Research Director of CNRS Strasbourg and creator of topological quantum field theory as well as the theory of WRT-invariants of 3-manifolds, along with the brilliant young mathematician Florian Deloup of CNRS Toulouse. The primary objective of the programme was to investigate the geometric and topological nature of the WRT-invariants, which is currently a wide open research problem.

In conjunction with this summer programme, the Pacific Institute and the University of Calgary sponsored an advanced research workshop at Nakoda Lodge in the Kananaskis area on July 18–22. The workshop brought together top experts in the areas of low-dimensional topology, algebraic topology and mathematical physics, to discuss the topics of topological quantum field theories, the structure and properties of the WRT-invariants, and surgery on low-dimensional manifolds. Among the top international experts in attendance were L. Crane, R. Lawrence, T. Le, R. J. Milgram, D. Rolfsen, L. Rozansky, A. Tralle, V. Turaev, and H. Zieschang.

The plenary lectures at the workshop featured announcements of entirely new theories, notably including Turaev's Homotopy Quantum Field Theory and Crane's innovative Categorical Model for Quantum General Relativity, which uses techniques from topological quantum field theory. Additionally, there a number of introductory talks for graduate students and for specialists from related areas, as well as a series of research discussion session which resulted in a number of new, innovative ideas and have led to several ongoing collaborative research efforts. The proceedings of the workshop will appear as a special volume of the journal *Topology and its Applications*.

All of the scientific goals of the summer programme were met and the universal consensus by the participants was that it was a very successful time. Indeed, preparation are underway to repeat the programme within the next 16 months!

I would like to thank Nassif Ghoussoub, Mike Lamoureux, Joanne Longworth, Marian Miles, Dale Rolfsen and Sandy Rutherford from PIMS, P. Michael Boorman (Dean of Science, University of Calgary) and Robert Woodrow (Associate Dean, Research, University of Calgary) for all of their efforts on our behalf. Finally, I would like to express my gratitude to my co-organizers David Hobill and Peter Zvengrowski and the student volunteers Andrej Bona, Tyler Lawson and Brian Pigott.

Report on the Workshop on Algorithms and Data Structures

A. Gupta
School of Computing Science
Simon Fraser University

From August 11–14, PIMS sponsored the 1999 Workshop on Algorithms and Data Structures (WADS) at the Harbour Centre campus of Simon Fraser University. More than 90 scientists from around the world participated in the workshop. Invited talks were given by five distinguished mathematical scientists: Marc Snir (IBM), Charles Leiserson (MIT), Nadia Thalmann (Geneva), Umesh Vazirani (UC Berkeley) and Jeff Vitter (Duke). As well, 34 contributed papers from more than 80 submissions were chosen by the program committee to be presented at the workshop. Additional funding for WADS was provided by the School of Computing Science, Simon Fraser University.

WADS alternates with the Scandinavian Workshop on Algorithm Theory and is a forum for researchers in the area of design and analysis of algorithms and data structures. Contributed papers presented original research results on the theory and application of algorithms and data structures in all areas, including combinatorics, computational geometry, databases, graphics, and parallel and distributed computing. This year's WADS was also the lead event for the current PIMS-Fields thematic year on Graph Theory and Combinatorial Optimization. Please see pages 6–7 for upcoming events in this thematic year.

The local organizing committee for WADS 99 was Binay Bhattacharya, Arvind Gupta, Art Liestman, and Tom Shermer.

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First Canada-China Conference a Success

A memorandum of understanding for extensive collaborations in pure and industrial mathematics is currently being finalized. A revised version of the current proposal to the Canadian International Development Agency (CIDA) is being developed. The new proposal will involve specific Chinese and Canadian industrial projects.

The week ended with a closing ceremony in which Nassif Ghoussoub invited all participants to the Second Canada-China Congress, which will be held at Vancouver in 2001. Finally, a large reception was given by the Canadian Ambassador, Howard Balloch in the Elvin Hamilton Room at the Canadian Embassy in honour of the Presidents of NSERC and NSFC. It was attended by over 140 guests including the University Presidents mentioned above as well as several other senior officials. The visit was particularly productive for President Tom Brzustowski who was able to have discussions with several senior Chinese officials including the deputy Prime minister for Science and Technology.

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Alberta Ministry of Science and Innovation

The Ministry of Innovation and Science is working to make Alberta a magnet for national and international investment in innovative science, research and technology, and to enhance the contribution of science, research, and information technology to the sustainable prosperity and quality of life of all Albertans. It is committed to ensuring that the focus, the priority and the pride in Alberta's innovative nature stays strong, and is working to create an environment in which Alberta's science and research communities can grow and prosper.

Report on the Tenth International Workshop and Conference in Stochastic Geometry, Stereology and Image Analysis

E. Enns
Dept. of Mathematics and Statistics
University of Calgary

The Tenth International Workshop and Conference in Stochastic Geometry, Stereology and Image Analysis was held at the University of Calgary from August 24–28, 1999. This conference had its major support from PIMS, for which we are very grateful. The meeting was organized by Ernest Enns, Peter Ehlers and John Matyas of the University of Calgary.

The meeting was comprised of a total of 44 full-time participants, including graduate students, post-doctoral fellows and faculty members from 11 countries. The meeting was opened by President Terry White who acknowledged PIMS support of mathematical research at the University of Calgary. An article was also published in the *Calgary Herald*, describing the meeting and acknowledging the role of PIMS in fostering such valuable research activities in Alberta.

The meeting was a resounding success both scientifically and intellectually, and its success coupled with the rich environment here in Alberta virtually assures that we will be asked again to host a similar meeting. The world's leading scientists in Stereology and Stochastic Geometry were here and gave presentations. This includes people such as Professor Hans Gundersen from Denmark, holder of the only Stereology Chair in the World; Professor Eva Jensen from Denmark and Adrian Baddeley from Australia, the two leading theoreticians in Stereology and Stochastic Geometry; Professors Wolfgang Weil and Rolf Schneider from Germany, the premier mathematicians in convexity and integral geometry, not to mention many other leading mathematical luminaries.

One of the very successful features of this conference were the *Conference Research Collaboration Presentations*. This session was open to anyone who had a problem for the group of experts to ponder or to present some preliminary research started during the last 3 days of the conference. Several people presented and it was a lively session, as the world experts were in attendance. This is an idea to carry forward to other meetings.

Upcoming PIMS Education Activities

Annual Meeting of the BCAMT

October 22, 1999

Killarney Secondary School, Vancouver

At this meeting PIMS will provide an out-of-province speaker. Sharon Friesen from Calgary will report on experiments in teaching and professional development. PIMS will also have an information table, and its Education Facilitator will collaborate in two presentations: with Cary Chien on math contests for elementary grades, and with Cynthia Nicol on the use of drama in teaching mathematics.

Mathematical Evenings at SFU

These have taken place in the past under different sponsorship and will be resurrected by PIMS this year, one in the fall another in the spring. They are intended as introductions to particularly interesting aspects of mathematics for secondary teachers and students. The first one, under the heading *Networks, Fuel-cells, Waves, and More* will take place on November 16, 1999, 4:30–8:00 pm, in the Images Theatre at SFU.

Alternative Math Education Night

November 23, 1999

Sidney Elementary School, Sydney, BC

These traditional events are organised by the PIMS site at UVic and take place twice a year, in the fall and in the spring, each time at a specific elementary school in the Victoria region.

Math in Science Fairs

In collaboration with the Science Fair Foundation (BC), PIMS will supply development expertise as well as judges and prizes to mathematical exhibits at science fairs in Abbotsford, Vancouver, and Victoria. The main event is the *Greater Vancouver Regional Science Fair*, on April 6–7, 2000.

Changing the Culture 2000

April 28, 2000

SFU Harbour Centre

As in previous years, this conference is intended to contribute toward bridging the gap between professional mathematicians and the public, especially educators. This time its particular focus will be on *Mathematics and Visualisation*.

PIMS Elementary Grades Math Contest

May 13, 2000

University of British Columbia

This Math Contest is open to students from Grades 5 to 7, with each grade competing in a separate division.

Continued from page 1.

Summer Programmes

Physiology and Mathematical Cellular Biology both conducted interactive computer laboratories in the PIMS-UBC Computer Lab.

Each of the participants in the Miniprogramme on Geometric Functional Analysis were provided with a desk and workspace in the newly renovated PIMS Central Office at UBC. The environment created by having these facilities lead to many inspiring discussions which carried on late into the night. We look forward to hosting many more such workshops at PIMS.

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