Pacific Institute for the Mathematical Sciences

Newsletter

email:pims@pims.math.ca
http://www.pims.math.ca

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BC Government Supports PIms Industry Liaison Programs

Following the decision of NSERC to support PIms with $200,000 per annum for the next two years, the BC government proceeded to award PIms $97,500 of funding for 1997-1998 from the Science and Technology Branch of the INFORMATION, SCIENCE AND TECHNOLOGY AGENCY. The funds will be used to further the mission of PIms as an organization that promotes the integration of the mathematical sciences between the research, industrial and educational communities.

PIms forum on industrial mathematics, SFU-UC

May 25-June 5,1998

Following on the heels of its highly successful Industrial Problem Solving Workshop (Page 2), PIms has recently announced an annual Forum on Industrial Mathematics to take place May 25 - June 05, 1998. The forum will feature a series of events designed to bring together academic scientists, graduate students, and industrial researchers in the mathematical sciences to investigate industrial mathematics. One of the main

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PIms thematic summer 1998: Math Economics and Finance

PIms is planning a group of activities dealing with mathematical problems arising in economics and finance for the summer 1998. The organizing committee consists of I. Ekeland (Paris), J.J. Laffont (Toulouse), H. Moulin (Duke), J. Weymark and W. Ziemba (UBC).

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The CRM, Fields and PIms launch MITACS: a Network of National Centers of excellence

A letter of intent for the establishment of an NCE in the mathematical sciences was submitted on November 1. This proposed network is an initiative of the three major research institutes which collectively link together research groups at universities across the country and a growing number of partners from the sectors of information technology, financial services and medical sciences. from the foundations of these centers, this Network in the **Mathematics of Information Technology and Complex Sustems (MITACS)** will build a broader, independent network that will capitalize on existing resources to pursue a unified research program of vital importnace and application to Canadian industry.

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The CRM and the Fields Institutes pledge $100,000 in support of PIms

Don Dawson, director of the Fields Institute and Luc Vinet, director of the CRM have agreed to provide interim financial support for PIms to help it through the period prior to the next NSERC competition. This should greatly strengthen the mathematical sciences community as a national presence in Canada. The 3 directors have also resolved to coordinate their activities at a national level and to integrate many of their programs. The three institutes are to submit their applications to NSERC before April 98 for the 1999-2003 funding cycle.

Director's Notes:

Nassif Ghoussoub, FRSC

My notes will simply be a long list of ``Thank you notes'' to those who contributed in making the last semester another successful one for our young institute. So, here we go:

Many Thanks

-- To **Galen Greer** (Sr. Policy Analyst) and **Calvin Shantz** , Director of the Science and Technology Branch of the Information, Science and technology Agency for recognizing early the role that PIms can play in our province and for all their help in the last two years in supporting PIms' mission and in promoting it at the various levels of the BC provincial government.

-- To **Don Dawson**, director of the Fields Institute and **Luc Vinet,** director of the CRM for their pledge to provide interim financial support for PIms to help it through the period prior to the next NSERC competition.

-- To **Dan Birch** (VP-Academic, UBC) and **Barry McBride** (Dean of science, UBC) for committing office and Lab space at UBC for the current headquarters of PIms.

--To **Bernie Bressler** (VP-Research, UBC), **Bruce Clayman** (VP-Research, SFU), **Alex McAuley** (VP-Research, UVic) and **R.S. Smith** (VP-Research, U.Alberta) for providing the necessary funds to support PIms efforts in the development of MITACS the NCE.

--To **Frieda Granot** (Dean of Graduate studies, UBC) for supporting the initial efforts of PIms by providing office space and by making a computer lab available for the participants of the first PIms thematic summer.

--To **Uri Ascher** (Director of the IAM) and **George Bluman** (Head of math,UBC) who frantically helped PIms with infrastructure support and equipment to ready the computer Lab for the PIms summer activities.

--To **Chris Elliott** who donated to PIms-UBC over 600 math books from the collection of her late husband and our former colleague, Larry Roberts.

--To **Gordon Semenoff** and **Doug Beder** (Physics, UBC) for their efforts in making the first PIms Industrial Problem Solving Workshop such a huge success and to **Anthony Peirce** for collecting and editing the proceedings of that workshop.

--To **Ed Perkins** who made sure that the first PIms thematic summer on ``Probability theory and its applications'' will be a hard act to follow.

--To **Pamela Hagen** (Westwood Elementary, BC) and **Sharon Friesen** (Bragg Creek, Alberta) for taking the PIms message to their schools and for inspiring their academic friends with their enthusiasm and their dedication to insure the highest quality of math education for our kids.

--To **Arvind Gupta**, Deputy Director of PIms for his tremendous efforts in spearheading the PIms application to NSERC for major equipment s and his leading role in the development of the letter of intent for MITACS the NCE..

What is new?

Due to the success of the first Problem Solving Industrial Workshop, PIms' executive has decided to make it a regular event and a part of a larger **PIms Annual Forum on Industrial Mathematics.** Every year, the forum will start with an extensive training camp in the modern methods of applied mathematics for graduate students and faculty members. In particular, topics like mathematical modeling , numerical methods and computer simulations should help in preparing the participants for the Problem Solving Industrial Wokshop. The next one will be in Calgary while the training

A report on PIms first industrial problem solving workshop

Sixty mathematical scientists (including over 20 graduate students) answered PIms' invitation to attend the first PIms industrial problem solving workshop at UBC on August 20. The following problems were presented by six industrial scientists:

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PIms Industrial Postdoctoral Fellows for 1997-1998

Supervised by PIms scientists working in concert with their industrial counterpart, PDFs split their time between the university and the company, carrying intellectual ideas between these two domains. PIms is presently sponsoring seven post-doctoral fellows:

. **Julong Du,** Image processing
Industrial partner: Canadian Cable Labs
Supervisor: R. Ward (UBC)

. **Paul Marechal**, Medical imaging
Industrial partner: Siemens
Supervisor: J. Borwein(SFU)

. **Y. Wang**, Algorithmic Optimization
Industrial partner: Amber Computer systems
Supervisor: Lou Hafer (SFU)

. **Deli Li,** Multiple Target Tracking
Industrial Partner: Lockheed Martin
Supervisor: M. Kouritzin (U.Alberta)

. **C. Jessop,** Multi-surface Geological Modelling,
Partner: Geological Survey of Canada
Supervisor: R. Blais (Calgary)

. **Yuriy Shkolnikov,** Financial Math
Industrial Partner: R.I.T.A. Labs, Inc.
Supervisor: G. Sick (Calgary)

. **M. Oosten**, Operation research
Industrial partner: BC Transit
Supervisor: M. Puterman (UBC)

PIms appoints industrial facilitators in BC and Alberta

These mathematical scientists are spending time interacting with both university researchers and industrial partners.. They are also working closely with the coordinators of all industrial workshops, industrial PDF's and PIms administrators. In particular, early responsibilities include organizing the Industrial Problem Solving Workshop. They have also initiated several industrial projects for PIms members. The following Industrial Facilitators have been appointed:

Dr. Dan Calistrate, University of Calgary, who is in his second year with PIms and is covering the Calgary area.

Dr. Mark Solomonovich, University of Alberta, started on August 1, 1997.

Dr. Huaxiong Huang, UBC and SFU was hired jointly with CICSR and will start on Januray 1, 1998.

PIms Postdoctoral Fellows for 1997/1998

. **S. Kwok-Kwong Choi,** UBC and SFU
Subject: Number Theory
Sponsor: David Boyd, Peter Borwein

. **Sadok Kallel**, UBC
Subject: Algebraic Topology
Sponsor: D. Sjerve

. **David A. Krebes**, UBC
Subject: Knot theory
Sponsor: Dale Rolfsen, K. Lam

. **Meijun Zhu,** UBC
Subject: PDE,
Sponsor: C. Gui.

. **Yves Lucet**, UA, UVic, SFU
Subject: Non-smooth Analysis
Sponsors: Jon Borwein, R. Poliquin, J. Ye.

. **John Michael Stockie,** SFU
Subject: Numerical Analysis
Sponsor: R. Russell

. **Rostyslav Hryniv,** U. Calgary
Subject: Spectral theory
Sponsor: P. Binding, P. Lancaster

. **Holger Teismann** , U. Victoria
Subject: Math Physics
Sponsor: Reinhard Illner

. **Qing Lin** , U. Victoria
Subject: Operator Algebras
Sponsor: Ian Putnam

. **Kazuhisa Makino,** SFU
Subject: Data Analysis
Sponsor: T. Kameda

. **David McNeilly,** U. Alberta
Subject: Fuschian groups
Sponsors: G. Cliff, A. Weiss, R. Moody

. **Martin Schlottmann,** U. Alberta
Subject: Quasicrystals
Sponsors: R. V. Moody

. **Zalman Balanov**, U. Alberta
Subject: Morse Theory,
Sponsor: W. Krawcewicz.

A report on PIms first industrial problem solving workshop

(continued form page 2)

1. Powertech Inc. Estimate the stress intensity of composite storage vessels. Such vessels are used, for example, for compressed gaseous fuels in natural gas or hydrogen vehicles.

2. Petro-Canada Corp. Devise a minimally sensitive method for vertical seismic profiling. The current methods are too sensitive to small errors.

3. MacMillan Bloedel Inc. Find the optimal placement of cuts in a log to optimize the total value of the resulting lumber.

4. Kinetic Sciences Ltd. Develop an efficient algorithm for fingerprint identification that uses a new low cost light scanner. This would allow extremely small fingerprint security systems.

5. BC Cancer Agency. Identify pre-invasive bronchial epithelial lesions from a single 2-dimensional section. This could result in much earlier and accurate predication of lung cancer.

6. MacMillan Bloedel Inc. Estimate the stress involved in thermorolls in order to determine the extent to which cracking is caused by normal maintenance.

The mathematical scientists split into six teams and worked on the problems for the next five days (and many nights!). Major progress was made in Problems 1, 2 and 6 with the industry scientists expressing their complete satisfication with the proposed solutions. Several conceptual suggestions made on problem 4 were positively received by Kinetic Sciences Ltd. and follow ups will be done by the company's researchers.

The analysis of problem 3 was deemed unsatisfactory by the MacMillan Bloedel representative but then, not all the constraints of the problem had been available to the scientists from the start. However, the analysis by the scientists determined that the problem is also intrinsically hard and that it would be difficult to devise an optimal strategy for all cases. A core group of scientists from this team will continue their investigation of the problem.

A most interesting experience was that of the team investigating Problem 5. Simultaneous to this workshop was a completely independent PIms event at UBC: The thematic summer in probability and its applications which was attended by over 100 world experts, At an overlapping coffee break, the Cancer Agency problem was ``leaked'' to the probabilists and Durett, a world leading mathematician from Cornell University went to work with the team which consisted mostly of graduate students. They devised a new stochastic model for the development of this type of malignant cells that will hopefully be pursued and eventually prove useful.

Overall the scientists found the workshop intellectually challenging and fun. Because the usefulness of this exercise wa apparent very early on, many of the industrial representatives stayed with their team for the entire time. Each team has now started writing a detailed report on their work and these will soon be widely distributed.

This workshop was an experiment to put into action many of the goals and aspirations of PIms. Clearly, it would not have beenpossible without the scientific critical mass that PIms can create by drawing on the resources of its five founding universities. A significant number of scientists (both faculty and graduate students) attended from all PIms sites offering over 3000 hours to Canadian industry without any remuneration. Their support of the Pacific Institute is not unrelated to the fact that PIms--with grants from NSERC, the government of British Columbia, the five founding universities and over a dozen industrial partners--has already contributed a great deal to the professional lives of its constituency during its inaugural year.

The CRM, Fields and PIms launch MITACS: a Network of National Centers of excellence

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Challenges of mathematical modelling and the management of complex and large-scale systems arise across the scientific, industrial, financial and medical sectors. Finding new tools to meet these challenges is intrisically collaborative work requiring a mix of mathematical, statistical and computational methodologies. This is an area where Canada is well-positioned to exploit because of the world-class group of researchers already in place. The major concentration areas for MITACS will be: **Inference from High Dimensional Data, Biomedical Modelling and Biostatistics, Risk Management, Modelling and Management of Computer and Communications Networks, Techniques for Resource Optimization, Mathematical Algorithms and Technology based Mathematical Tools and Cryptography.**

PIms forum on industrial mathematics, SFU-U.Calgary

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goals of the forum is to train graduate students in the various aspects of high-level industrial mathematical research and this theme is clearly evident in the selection of events.

In its inaugural year, the forum will feature three marquee events. Kicking off the forum will be a one week **Graduate Industrial Modeling Workshop** at SFU from May 25-29, 1998. Between 25 and 30 graduate students from the PIms universities will come together to learn techniques for solving industrial mathematics problems. The participants will work in small groups learning the most recent modeling techniques from experts in the field. The students will come away with a foundation for understanding and contributing to the next two events. Immediately following the modeling workshop will be the annual meeting of the **Canadian Applied Math Society (CAMS)** in downtown Vancouver (May 28-31). The graduate student attendees from the workshop will have a chance to hear research talks by some of the best applied mathematicians from across Canada. They will see how many of the techniques they just learned have been applied to make major breakthroughs in applied mathematics.

The following week (June 1-5) PIms will sponsor the **Second Industrial Problem Solving Workshop** at the University of Calgary. Once again PIms will solicit industrial problems from industry in BC and Alberta with teams of graduate students and scientists working together to model these problems and ultimately yield partial or full solutions. It is anticipated that many of the participants at the CAMS meeting will take the unique opportunity of attending the workshop. PIms will cover the travel expenses of the graduate students attending the first two events. The students will now have a chance to try out their newly acquired skills and make a significant contribution to the solutions of these new problems.

PIms thematic summer 98: Math economics & finance

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The goals are:
-- to expose graduate students, the scientific community at large and the banking sector to the modern aspects of mathematical economics and finance;
-- to introduce Canadian mathematicians to the interesting mathematical problems arising in these fields;
-- to develop this new and thriving area of mathematical research in Western Canada and to connect the mathematicians with the business and management schools; and
-- prepare interested mathematics graduates for work in the banking sector.

LIST OF EVENTS:

° International Meeting of the Society for Social Choice and Welfare Conference, July 3-6, Contact: weymark@econ.ubc.ca (J. Weymark).

° Mathematical Models for cooperative economics and Distributive Justice, July 2,7,8,9, Contact: weymark@econ.ubc.ca (J. Weymark).

° Summer Conference on Industrial Organisation , July 10-11, Contact: ross@nervana.commerce.ubc.ca (Tom Ross).

° Design of markets and organisations under incomplete information, July 13-17, Contact: rochet@cict.fr (J.J. Rochet).

° Mathematical methods in consumer theory, July 19, 24, Contact: ivar.ekeland@dauphine.fr (I.Ekeland).

° Tutorial program on Stochastic Programming, Aug. 8-9, Contact: ziemba@interchange.ubc.ca (W. Ziemba).

° Conference on Stochastic Programming, Aug. 10-24, Contact: ziemba@interchange.ubc.ca (W. Ziemba).

° Asset and Liability Management Seminar for Institutional Investors,Aug.15-16, Contact: ziemba@interchange.ubc.ca

Math Education in schools: A PIms Priority

Mathematical Scientists at all of PIms member institutions have a deep commitment to mathematics education.

-- On October 2, 1997, PIms hosted an evening on **Alternative Math Education** at Hillcrest Elementary School, Victoria, B.C. Organized by **R. Illner and D. Leeming**, the program consisted of demonstrating "Fun" methods to teach math and computer science concepts to children (and adults!) by games and art: Bubbles, Constellations as 2D Networks, Computer Science Unplugged and Mega-Math, Exciting Geometrical Models from Straws and Paper , The Penny Game, The Set Game and more!

-- Watch for the **PIms-CMS education session** to be held in Victoria, december 14-17, 1997 featuring a public talk by **Maria Klawe** on "Mathematics, Computers and Your Daughter's Future" as well as lectures by **Neal Koblitz, Pamela Hagen, Michael Fellows, Reinhard Illner, George Bluman, Geri Lorway and Peter Taylor.**

-- Also watch for the upcoming **Conference on Changing the Culture** to be held at SFU on Feb.20-21, 1998 featuring talks by **Peter Taylor** (Queen's University) and **Bruce Schawyer** (Memorial University). Participants will include those from the mathematics community, mathematics teachers and people from industry. Two main themes for discussion groups will be *"What sort of mathematics do we want to see in the school setting?"* and *"Doing mathematics with Children."*

PIms and HPC-net support the Polymath Group at CECM

In collaboration with the High Performance Computing Network (HPC-net), PIms is sponsoring the Development of a **Truly Distributed Computing Environment**. The project will include the development of tools that allow researchers at different locations to work together as well as to develop and share computational tools effectively. The research and development will be carried out by the **Centre for Constructive and Experimental Mathematics (CECM)** at SFU.

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PIms sponsors the Sun Microsystems Site at UBC

On the heel of their success in obtaining a major academic equipments grant from Sun Microsystems, **the Living Math Group** at UBC led by **Bill Casselman** has also succeeded in securing a SunSite status that will be co-sponsored by PIms. In particular, PIms has hired Djun Kim as a half-time manager of the site.

PIms Contact List

Director: N. Ghoussoub (UBC)
Admin. Asst: Sharon Philips
Phone: 604-822-9328
Fax : 604-822-0883
e-mail: director@pims.math..ca

SFU-site Director: A. Gupta (School of Comp. Sci.)
Admin. Asst: Thomas Uphill
Phone: 604-291-3349
Fax : 604-291-3045
e-mail: arvind@cs.sfu.ca

UVic-site Director: Ian Putnam (Maths & Stats)
Admin. Asst: Kelly Choo
Phone: 250-472-4271
Fax : 250-721-8962
e-mail: chook@math.uvic.ca

UBC-site Director: D. Rolfsen (Dept. of Maths)
Admin. Asst: Emma McEntee
Phone: 604-822-3922
Fax : 604-822-0883
e-mail: rolfsen@math.ubc.ca

UA-site Director: A. Rhemtullah (Math. sciences)
Admin. Asst: Patti MacDonald
Phone: 403-492-3396
Fax : 403-492-6826
e-mail: patti@vega.math.ualberta.ca

UC-site Director: C. Laflamme (Maths & Stats.)
Admin. Asst: Joanne Longworth
Phone: 403-220-5203
Fax : 403-282-5150
e-mail: jlongwor@acs.ucalgary.ca