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## PIMS: Base Funding From NSERC For 1999-2003

## MITACS: One of Three New Networks in NCE Program

The Mathematics of Information Technology and Complex Systems Network (MITACS), a new Canadian mathematical network, will benefit from a federal investment of close to \$14.5 million over the next four years. The new network was established through a national competition in the Networks of Centres of Excellence Program. MITACS will be administered by the CRM in Montreal, The Fields Institute in Toronto, and the Pacific Institute for the Mathematical Sciences in B.C. and Alberta.

MITACS was the second major funding success for PIMS, as the Natural Sciences and Engineering Research Council of Canada (NSERC) recently announced \$2.4 million as base funding for PIMS over the next four years to establish it as the third major mathematical sciences research institute in Canada.

According to Ron J. Duhamel, Secretary of State (Science, Research and Development, and Western Economic Diversification), MITACS will develop new mathematical tools crucial to many sectors of the Canadian economy, with applications to areas such as the unlocking of the genetic code of biological materials, analysis of environmental health factors, and evaluation of risks that impact costs and prices. *(continued on Page 2)*

### BC and Alberta match NSERC's funding for PIMS

NSERC's \$600K annual support for PIMS will be matched by a cash contribution of \$800K per year from B.C. and Alberta sources. This was made possible thanks to a tremendous show of vision and partnership by the five PIMS founding universities, the B.C. Government through the Information, Science and Technology Agency, and the Alberta Government through the Alberta Science Research Authority. This contribution comes in addition to the substantial in-kind support (Infrastructure, Space) that the five major universities in BC and Alberta continue to provide for PIMS operations.

### The 3x3 Canada-China Mathematics Initiative

The 3x3 Canada-China Consortium is an exciting initiative of UBC, McGill/U. de Montreal and U. of Toronto, and the three Chinese Universities of Nankai, Peking and TsingHua. Its objective is to develop close, effective links among these intellectual centres in areas of common interest so researchers and students from both countries can collaborate and benefit from the distinct strengths and perspectives of the partner institutions.

Mathematics has been identified as a priority area and many of the planned activities rely on the infrastructure provided by the Nankai, Peking, and TsingHua Math Institutes, and their three Canadian counterparts, the Fields Institute in Toronto, the CRM in Montreal, and PIMS in Western Canada. The Initiative will include joint participation in institute programs as well as joint research workshops and special intensive courses for graduate students, providing opportunities for young Chinese and Canadian students to understand how mathematics is taught and applied in the context of the other country.

During the week of Nov.16-20, senior representatives of the three Chinese Math Institutes were invited to Vancouver for planning meetings with the Directors of the Fields Institute, the CRM and PIMS, the program leader of MITACS and the President of the Canadian Mathematical Society.

### First Canada-China Math Congress

The first 3x3 Canada-China Mathematics Congress will be held August 23-28, 1999, on the TsingHua University campus in China. Over 100 Canadian mathematicians will join 200 of their Chinese colleagues for this extraordinary event which is expected to jump-start numerous scientific and educational collaborations between the two countries. *(Continued on Page 8)*

### What's inside...

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# Director's Notes:

## *Nassif Ghoussoub*

I am pleased to report that two years after its official birth, the Pacific Institute for the Mathematical Sciences has reached a successful outcome in its quest to secure long term base funding from its provincial and federal partners. Indeed, PIMS is to expect more than 5.6 million dollars of support for the next four years from the Natural Science and Engineering Research Council of Canada (NSERC), the BC Information, Science and Technology Agency (BC-ISTA), the Alberta Science and Research Authority (ASRA), and from the PIMS founding universities.

Behind this phenomenal success stand PIMS scientists who have, over the last three years, collectively conceived and built what was required: a unique institution which has evolved in a relatively short time into one of the most valuable assets of the mathematical sciences community in Canada, and an integral part of the international scientific community. This extremely positive development also results from a tremendous show of leadership, goodwill and partnership from many senior administrators of the institutions involved: **Tom Brzustowski** (President, NSERC), **Janet Walden** (Director General, RPP, NSERC), **Nigel Lloyd** (Director General, Research Grants, NSERC), **Calvin Schantz** (Director, BC-ISTA), **Galen Greer**, **Bob Fessenden** (President, ASRA), **Barry McBride** (VP-Academic and Provost, UBC), **Jack Blaney** (President, SFU), **Len Bruton** (VP-research, UCalgary), **Dick Peter** (Dean of Science, UAlberta), **Colin Jones** (Dean of Science, SFU), **Mike Boorman** (Dean of Science, UCalgary) and **Hugh Morris** (Chair of PIMS Board) among others. We'd also like to note the positive and constructive role of **Luc Vinet**, Director of The CRM, **Don Dawson**, Director of The Fields Institute and **Steve Halperin**, the Program Leader of MITACS.

An equally satisfying event for our mathematical scientists is the establishment of MITACS as a new Network of Centres of Excellence (NCE). With a federal investment of more than \$14.5 million over four years, this NCE will bring together 175 researchers at 24 Canadian universities to work with more than 40 public and private sector organizations to develop new mathematical tools for Canadian industry.

MITACS was created by CRM, Fields and PIMS. By working together, the three institutes created 21 pan-Canadian teams of researchers who will address problems in five important sectors of the Canadian economy.

The success of MITACS and PIMS are not unrelated. Indeed, MITACS could not have been conceived without the current level of development of PIMS in Western Canada. It could not have been stimulated without the energy and efforts

of the PIMS initiative which, in the last three years, has engendered a many-fold increase in organized activity in mathematical research and industrial collaboration in Western Canada. It could not have been developed without the vigorous involvement of the PIMS scientists in every one of the organizational steps that finally led to the successful birth of the MITACS Network. Moreover, the PIMS teams within MITACS are to carry a substantial part of the research and the technology transfer efforts. Generous financial support for the effort of developing MITACS in Western Canada was provided by **Bernie Bressler** (VP-Research, UBC), **Colin Jones** (Dean of Science, SFU) and **Ron Marteniuk** (Dean of Applied Science, SFU).

Through PIMS and MITACS, we are developing the Canadian scientific infrastructure and creating exciting opportunities for the following generations of mathematical scientists. To all those who made this new set of opportunities happen, I can safely say today that all mathematical scientists in Canada are grateful and ready for the challenge.

## **PIMS and MITACS Funding**

*(Continued from Page 1)*

Noting the network's goal of "harnessing Canada's mathematical power for the 21st century", Dr. Tom Brzustowski, Chair of the NCE Steering Committee, in an Oct. 16 press conference in Toronto, added: "Already the MITACS network pools the talents of 174 eminent researchers from 22 universities with partners from 34 companies and eight other organizations to offer creative solutions to complex issues critical to our future. The value and importance of MITACS is underlined by the \$1.5 million contribution from its partners."

Dr. Nassif Ghoussoub, Director of PIMS, highlighted "the vision, strength, versatility and dynamism of the mathematical scientists in Western Canada whose contribution was crucial to the attainment of this historic investment in the mathematical sciences in Canada."

Dr. Steven Halperin, the scientific leader of the new network, concluded the press conference: "MITACS is truly a national proposal. With nine (of 21) project leaders from the west and others in Ontario and Quebec, it binds the country with mathematical ties as surely as the railroads provided physical ties a century ago."

## 2nd PIMS Graduate Industrial Mathematics Modeling Camp

May 24-28, 1999

Following the success of the first Graduate Industrial Mathematics Modeling Camp held at Simon Fraser University in May, 1998, PIMS will host the second one on the campus of the University of Alberta, May 24-28, 1999.

This intense, one-week training camp is an excellent opportunity for graduate students in Canadian universities across the country to gain experience in mathematical modeling and learn from experts. Participants will also have the opportunity to attend the annual PIMS Industrial Problem Solving Workshop to be held at the University of Victoria, May 31-June 4, 1999.

Financial support is available from PIMS.

For more information, please contact Dr. G. Swaters at the Dept. of Mathematics, University of Alberta, or Dr. H. Huang at PIMS.

## Third PIMS Industrial Problem Solving Workshop

May 31-June 4, 1999

The annual Industrial Problem Solving Workshop in 1999 will be held at the University of Victoria, May 31-June 4, 1999. The workshop will follow previous formats. About six companies will be invited to present their problems to academic participants during the first day of the workshop. Groups will then be formed to work on the problems for the remainder of the week and each group will present their results on the last day of the workshop. A proceedings will be compiled and distributed by PIMS following the workshop.

Faculty members, postdoctoral fellows and graduate students are encouraged to participate in the workshop. Financial support is available from PIMS.

For more information, please contact Dr. C. Bose at the Department of Mathematics and Statistics, University of Victoria, or Dr. H. Huang at PIMS.

## Industrial Mathematics

### A New Advanced Course

A new course, *Mathematical Modeling and Analysis of Industrial Problems*, will be offered in January 1999 by Dr. Michael Ward, a recent winner of the prestigious Steacie Fellowship and a Professor of Mathematics at the University of British Columbia. This course is designed to help industrial research scientists to enhance mathematical and modeling skills. The targeted audience consists of graduate students and industrial research scientists.

## CICSR/PIMS Industrial Working Seminar Series

The first presentation of the 1999 CICSR/PIMS Industrial Working Seminar Series will be given by Dr. O. Walsh from FinancialCad, a financial software developer based in Surrey. The seminar will be held on the University of British Columbia campus in January, 1999 with details of location and time to be announced soon.

### Abstract:

*There are many current mathematical challenges in the world of finance. We need to develop better models in areas such as interest rates, energy (particularly electricity) and credit. In these situations, one or more of the fundamental market assumptions in the Black-Scholes framework are violated. Efficient and accurate pricing and hedging algorithms for derivatives based on these models are needed. Finally, we want to quantify the risk (e.g. value at risk) contained in a portfolio of financial instruments.*

*An overview of the many challenges will be presented with an emphasis placed on the question of realistic and practical market assumptions.*

## PIMS Graduate Weekend II

Jan 19-24, 1999

The second PIMS Graduate Weekend will be held on the campuses of the University of Alberta and the University of Calgary, Jan. 19-24. The goal is to give promising Canadian undergraduates a chance to learn more about the mathematical sciences graduate programs at the five PIMS universities in Alberta and British Columbia.

Students that meet our graduate criteria will be invited from all over Canada to be PIMS guests at the Graduate Weekend. It is an opportunity for them to interact with faculty and graduate students and to meet their peers from across Canada.

For more information contact Dr. G. Swaters at [gordon.swaters@ualberta.ca](mailto:gordon.swaters@ualberta.ca)

Participants will have the opportunity of attending the PIMS Annual Industrial Problem Solving Workshop. In this course Dr. Ward will adopt, to a substantial extent, a case studies approach to the modeling and analysis of various physical and industrial problems. This intensive course will be modeled after a similar course offered at Oxford University. This is a first step in an effort to develop a new industrial mathematics program at UBC and eventually at the other PIMS universities.

For more information, please contact PIMS, or the Department of Mathematics at UBC.





## Canadian Operator Theory and Operator Algebras Symposium

The 26th Annual Canadian Operator Theory and Operator Algebras Symposium was a great success. Organized by Anthony Lau and Laurent Marcoux, and held at the University of Alberta, May 21-26, 1998, this symposium was jointly sponsored by PIMS and the Fields Institute, with additional support from the University of Alberta. It was well attended by participants from thirteen different countries, representing three continents. The success of this symposium is testament to the vitality of the Operator Theory/Algebras community in Canada.

The principal speakers were Professor Gert. K. Pedersen (University of Copenhagen), Professor Raul Curto (University of Iowa), Professor Ken Davidson (University of Waterloo), Professor George Elliott (Universities of Copenhagen and Toronto), Professor Don Hadwin (University of New Hampshire), Professor David Handelman (University of Ottawa), Professor Eberhard Kaniuth (University of Paderborn), Professor David Larson (Texas A&M), Professor Vitali Milman (Tel Aviv University), Professor Vern Paulsen (University of Houston), Professor Zhong-Jin Ruan (University of Illinois at Urbana-Champaign), and Professor Roger R. Smith (Texas A&M). In addition, there were also 29 contributed talks.

*To see conference photographs and obtain a list of participants see the conference website:*

<http://www.pims.math.ca/sections/activities/exthem98.3.html>

### PIMS Knot Project

As part of its mandate to promote information technologies, PIMS is sponsoring a KNOTPLOT website, designed by Dr. Rob Scharein. This site (recently voted scientific 'website of the month') has an impressive array of color graphics displays of knots, links, braids, surfaces and related objects. Also under development by Scharein is a interactive JAVA-based Knot server, which will calculate mathematical invariants associated with knots input remotely, find minimal energy positions, etc.

The theory of knots is being applied to molecular biology, polymer physics and many other scientific disciplines. The Knot Server is designed as a practical resource for this scientific community, and will include explanations of the knot theoretic ideas behind the calculations.

This project is coordinated with a related initiative centered in the US, the Knot Project, which will also sponsor a major museum exhibit on knots, at the Boston Museum of Science in the year 2000.

## Western Canada Linear Algebra Meeting

The fourth meeting of the Western Canada Linear Algebra Meeting (WCLAM) was held at the University of Victoria on July 30-31, 1998. WCLAM provides an opportunity for mathematicians in western Canada working in linear algebra and related fields to meet, present some of their recent research, and exchange ideas in an informal atmosphere. Previous meetings were held in Regina (1993), Lethbridge (1995) and Kananaskis Village (1996).

There were 37 participants at the Victoria meeting, and while many were from WCLAM's natural base in western Canada, the meeting also attracted people from Australia, Greece, Holland, Poland and the U.S.A. The program featured two invited talks by Stephen Boyd and Jennifer Seberry, as well as lectures by H. Bart, T. Bhattacharya, R. Craigen, J. Drew, R. Edwards, S. Fallat, D. Farenick, C-H Guo, R. Hryniv, H. Kharaghani, J. Muldowney, P. Psarrakos, B. Watson and K. Wood. The presentations spanned a number of research areas, including matrix theory, operator theory, linear algebra, combinatorics, matrix functions, designs, differential equations, optimization and Markov chains. In addition to the talks, there was also an informal open problem session.

The organizing committee is happy to thank both the University of Victoria, and the Pacific Institute for the Mathematical Sciences for providing partial support for the meeting. In light of the level of interest displayed at the Victoria gathering, a WCLAM in the year 2000 is being contemplated.

### PIMS Workshop on Network and Computer Security

From May 26 to May 31, PIMS hosted a workshop on Network and Computer Security in Banff, Alberta. The workshop consisted of three days of presentations and informal discussions about cryptography, followed by two additional optional days for informal discussions. The focus was on ways of addressing discrepancies between theoretical and practical perspectives. It is clearly desirable for practitioners to best utilize theoretical results, and for theorists to account for important practical concerns. For example, a number of problems that were "solved" in the 1980s with protocols that require a "polynomial" number of rounds of interaction are still open if only a small constant number of rounds of interaction are available.

*Abstracts of the talks presented at the workshop are accessible from the workshop web site:*

<http://www.cpsc.ucalgary.ca/~pims>.

## Education Task Force

Early in the new year, PIMS will launch a long range program to support K-12 education and enhance public awareness of mathematics. Following the recommendations of a recent task force report, PIMS will establish a broadly based Education and Communication Group (ECG). Since the strength of PIMS rests in the mathematical culture of its five founding universities, the ECG will focus on activities which effectively utilize this expertise.

Here are some of the report's key recommendations:

*The appointment of Education and Communication Facilitators in BC and Alberta, part-time salaried employees to act as an interface with the public and assist with organizing and coordinating activities, thus easing some of the administrative burden on the many volunteers who support the program.*

*Autonomous Local Outreach Groups at participating PIMS sites, each with a Head and a supporting Local Action Team to oversee a local budget. Additional resources for "local Facilitators" will be available at some sites as well. This recognizes the reality that most events will continue to be locally organized. These Groups will involve representatives from a variety of sectors and will enable a larger number of people to become Members of, and active in, the ECG.*

*A Steering Committee to ensure cohesion and communication between sites. Consisting of the Heads and the Facilitators, it will allocate funds for larger projects on a regular basis, award a yearly prize in mathematical exposition and oversee the budget of the entire Group. In keeping with the nature of PIMS, all its members will have a strong background in mathematical research.*

Although the Task Force was based in BC, it consulted extensively with colleagues in Alberta. The proposal will be reviewed and updated in two years' time. PIMS would like to thank the Task Force Members: Sue Haberger (Centennial Secondary), Klaus Høechemann (UBC, chair), David Leeming (U. Vic.), Susan Oesterle (Douglas College), and Ed Perkins (UBC).

## Changing the Culture II

### Narrowing the Gap

*Friday and Saturday, February 19 - 20, 1999  
Simon Fraser University, at Harbour Centre*

The Second Annual Changing the Culture Conference, organized and sponsored by the Pacific Institute for the Mathematical Sciences, will again bring together mathematicians, mathematics educators and school teachers from all levels to work towards narrowing the gap between mathematicians and teachers of mathematics, and between those who enjoy mathematics and those who don't.

Conference program will include three plenary lectures:

- **Ingenious mathematical amateurs: M.C. Escher (artist) and Marjorie Rice (homemaker)**,  
Doris Schattschneider, Moravian College
- **The study of living things: So, What's Math Got To Do With It??**  
Leah Keshet, University of British Columbia
- **Would Pythagoras have liked Mozart?**  
Adrian Lewis, University of Waterloo

Two panel discussions, and small group discussions will complete the program. Planned topics include Numeracy, Mathematics and the Arts, and "Mathematics as a Spectator Sport". Confirmed panelists include: Ron Coleborn, Kanwal Neel, Doris Schattschneider and Owen Underhill.

The registration fee is \$30 and includes Friday lunch and refreshments. Registration is limited to 120 participants. Detailed program and registration forms will be distributed in Mid-January.

Additional support provided by the Simon Fraser University and the Canadian Mathematical Society is gratefully acknowledged.

*For more information please contact PIMS.*

## CELEBRATION

### *Western Component of MITACS and Canada-China Mathematics Initiative Launched*

A ceremony was held at the University of British Columbia on November 18 to celebrate the launching of two major initiatives with a huge impact on the Canadian mathematics community: MITACS and the Canada-China Math. Initiative. (See articles pages 1 and 8).

In Attendance were the Directors of the four major Chinese Math institutes, the Consul General of the People's Republic of China, the Directors of PIMS, Fields, and CRM, as well as the Presidents of the Canadian and Chinese Mathematical Societies and the National Coordinator of the Canada-China Initiative. On

behalf of the MITACS Network, attending dignitaries included the MITACS Program Leader, scientists involved in MITACS projects, and representatives from many of the western industrial sponsors of the network. Also in attendance were the Presidents of NSERC and the Alberta Science and Research Authority, the Director of the BC Information, Science and Technology Agency, as well as local and national media. The successful ceremony was led by Jack Blaney, President of SFU and Barry McBride, VP-Academic and Provost of UBC. It included speeches, demonstrations of technological tools and a reception.

# MITACS

## New Canadian Mathematics Network Established

The Mathematics of Information Technology and Complex Systems (MITACS) is a new Network of Centres of Excellence (NCE). With recently announced federal investment of more than \$14.5 million over four years, this NCE will bring together 175 researchers at 22 Canadian universities to work with more than 40 public and private sector organizations to develop new mathematical tools for Canadian industry.

MITACS is administered by the three mathematical sciences institutes in Canada: The CRM in Montreal, the Fields Institute in Toronto, and PIMS in British Columbia and Alberta. The combined efforts of the three institutes created 21 pan-Canadian teams of researchers who will address problems in five important sectors of the Canadian economy:

### *The Biomedical Sector*

MITACS will focus on the development of new mathematical models for understanding and diagnosing diseases. Researchers will work with the Canadian bio-medical industry to improve diagnosis, prevention, and design of treatments for diseases ranging from ALS to disorders in the auditory system. Issues of public health and safety will also be dealt with.

### *The Information Technology Sector*

MITACS is involved with many of Canada's leading companies in projects ranging from the development of communication networks to new techniques for verifying the behaviour of computer systems under various conditions.

### *The Industrial Commercial Sector*

MITACS will work with a number of companies to develop new techniques for handling large amounts of inventory, for developing optimal scheduling and deployment of resources, and for determining the optimal placement of physical assets.

### *The Industrial Manufacturing Sector*

MITACS will work with Canadian companies to develop mathematical tools for understanding new sophisticated materials used in the manufacturing process. This could range from materials used for vessels under extremely high pressure to fuel cells.

### *The Trading and Finance Sector*

The financial world continues to add new and sophisticated financial instruments. MITACS will develop new mathematical tools to better understand these instruments and the underlying risk so they can be priced optimally and allow for proper portfolio management.

A main focus of MITACS is the training of highly qualified personnel. Sharply increased demand, the shortage of qualified personnel and the lack of appropriate training opportunities in the emerging industrial sectors is a current problem Canada faces along with all other G7 nations. One of the most significant impacts MITACS will have on the Canadian economy is through the training of qualified personnel in the areas of applied mathematics on which the network is focused. In the next four years, MITACS will generate approximately 400 person-years of graduate student work, 190 person-years of post-doctoral training, and 60 person-years of technical and professional research assistant positions.

## Canada-China Math Congress

*(Continued from Page 1)*

There will be 10 plenary speakers, 12 special sessions and 3 mini-courses for graduate students. The organizing committee consists of N. Ghossoub (PIMS), K. C. Chang (Peking University), Lizhong Peng (Peking University), Dayong Cai (Tsinghua University), Xingwei Zhou (Nankai University), Steve Halperin (University of Toronto), D. Dawson (Fields Institute), R. Kane, (CMS) and L. Vinet (CRM).

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