Pacific Institute for the Mathematical Sciences Newsletter

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Contents



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- **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**.

## PIMS Central Office Moves to New Facilities at UBC

The PIMS central office has been provided with a 4,800 sq. ft. research facility on the UBC Campus. The space has been totally renovated and furnished with computers and equipment, thanks to contributions from UBC and the NCE provincial infrastructure fund. This will allow us to accommodate up to 30 PIMS and MITACS scientists and visitors. We are looking forward to occupying the new facility, located at 1933 West Mall, on June 17. PIMS also utilizes the scientific computing lab which has been provided courtesy of Frieda Granot (Dean of Graduate Studies). The lab has been revamped thanks to an NSERC equipment grant recently awarded to the PIMS UBC-Site director, Dale Rolfsen.

# NSERC's President Leads 60 Canadian Mathematicians to China

More than 60 Canadian mathematical scientists will participate in the *First 3×3 Canada-China Mathematics Congress,* which will be held August 23–28 on the Campus of Tsinghua University in Beijing. Tom Brzustowski, the President of the Natural Science and Engineering Research Council of Canada and senior Chinese officials will participate in the inaugural activities as well as in panel discussions about the Canadian and Chinese experiences in Scientific Research and Technology Transfer. It is expected that this congress will be the starting point for the establishment of a sustained scientific collaboration between the two countries and will help to provide clear directions for future joint projects in the mathematical sciences.

*See* ***Canada-China,*** *page 13.*

## Third Annual PIMS Industrial Problem Solving Workshop: A Continuing Success

Frank Ruskey, PIMS UVic Site Director

The Pacific Institute proudly hosted its third annual Industrial Problem Solving Workshop on the campus of the University of Victoria from May 31 to June 4. About 100 faculty, graduate students, postdoctoral fellows, and industry scientists came together to work on challenging industrial problems. This year's workshop followed the same successful format established in previous years.

*See* ***Industrial Problem Solving Workshop,*** *page 4.*

## CRM-Fields-PIMS Announce National Committee

The three Canadian Institutes in the Mathematical Sciences, Centre de recherches mathématiques (CRM), The Fields Institute for Research in Mathematical Sciences, and The Pacific Institute for the Mathematical Sciences (PIMS) are pleased to announce a new program for the support of joint activities in the mathematical sciences. This program will be administered by a National Programme Committee, which will make recommendations to the Directors of the three institutes.

*See* ***National Committee,*** *page 3.*

*Nassif Ghoussoub, FRSC*

After a two-year interim period, the Pacific Institute for the Mathematical Sciences is now entering its first year of full operations. The highlights of this new transition are:

**A General Guide for PIMS Programs:** This comprehensive guide –which will be widely distributed– describes in details all of our programs, their objectives, their guidelines and also the decision-making process for each one of them. The Guide describes the PIMS *Core Programs:* These will be continuing in nature as they are deemed crucial for the achievement of the PIMS industrial, educational and scientific mandate. It also describes the *General Scientific Programmes* that are meant to assist, support or co-sponsor activities that are compatible with our mandate but possibly initiated by other organizations.

**Research Facilities at the 5 PIMS sites:** These include computer labs, office space for PIMS' postdoctoral fellows, visitors and participants in the thematic programmes as well as interdisciplinary space where industrial partners, math educators can get together with PIMS' mathematical scientists to discuss, initiate and develop whatever it takes to achieve their common goals. For now, PIMS can count on UBC's PIMS facility which will be ready by June 15th. The SFU facility should be ready by the end of the summer. We are of course hoping that soon, PIMS will be able to offer such a facility at each one of its sites.

**The PIMS Distinguished Chair Programme** which supports one visiting distinguished mathematical scientist at each one of PIMS' sites. The holder of the chair is expected to visit one of the PIMS universities for at least one month and give a mini-series of lectures. Lectures notes are also to be compiled by the chair holder with the assistance of interested graduate students.

**The PIMS Collaborative Industrial Program** which supports academic/industrial collaborative activities in the Mathematical Sciences. The PIMS contribution will be directed towards the support of highly qualified personnel (Graduate students, PDFs, research assistants) in the mathematical sciences working directly on the activity. This programme should be helpful for research groups who are currently initiating industrial contacts and have future plans for a larger collaborative effort such as those within the MITACS Network of Centres of Excellence.

**The PIMS Annual General Meeting** which is designed to bring together PIMS members from the five founding universities along with appropriate members of the industrial, and educational communities to consider issues relating to PIMS programs. Members break into working groups to discuss current and new programmes, policies surrounding programmes and any other pertinent issues. The PIMS annual meeting is held in the first week of December, to be immediately preceeded by the PIMS PDF Workshop and to be followed by the meeting of the PIMS Board of Directors.

cation and industrial outreach with a suggested value of $3,000 for each prize. Consideration will be given to following the tradition of naming these prizes after distinguished individuals. However, until suitable names are found, the names of the prizes will be: the PIMS Education Prize, The PIMS Research Prize, and the PIMS Industrial Outreach Prize.

Finally, let me say that the resignation of Luc Vinet and Steve Halperin from the CRM and MITACS respectively, are major losses to the Canadian Mathematical Community and in the case of Steve, to the Canadian Scientific effort as a whole since he is leaving the country. Luc is moving on to become VP-Academic at McGill University in June while Steve is unfortunately leaving Canada to be Dean of Science at the University of Maryland at College Park. While dreading their departures, I warmly congratulate Luc and Steve for taking on these new challenges.

## PIMS to Award Three New Prizes

The PIMS Board of Directors has approved the creation of three prizes to be awarded annually. The prizes should be for mathematical research, education and industrial outreach. Nominees for each prize would be nominated by three sponsors who would provide a cover letter explaining the nominees contribution, impact and relevance for the prize, a CV of the nominee, a publication list, list of creative works, or list of industrial products, relevant samples of the nominees works, such as reprints, patents, or educational materials.

### PIMS Education Prize

In keeping with the PIMS mandate to promote the enhancement of education and training in the mathematical sciences and to broaden the communication of mathematical ideas and concepts, PIMS is to create a prize honouring members of the PIMS community who have made significant contributions to education in the mathematical sciences. This prize is intended to recognize individuals from the PIMS member universities or other educational institutions in Alberta and British Columbia, who have played a major role in encouraging activities which have enhanced public awareness and appreciation of mathematics as well as fostering communication among various groups and organizations concerned with mathematical training at all levels. The individuals who will be so recognized by this honour will have been instrumental in efforts providing resources for the ongoing professional development for mathematical educators at all levels. For this prize it is expected that at least one of the sponsors for the nominee should come from the university community.

Nominations for the PIMS Education Prize will be adjudicated by a suitable ad hoc committee to be appointed by the PIMS Board of Directors in consultation with the Director. *See* ***Research Prize,*** *page 3.*

### PIMS Research Prize

In keeping with the PIMS mandate to promote research in the mathematical sciences, PIMS will create 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 disseminated during the five-year period prior to the award being given. This award is designed specifically to recognize major current research initiatives rather than being an award for lifetime achievement, as there are already such awards in existence. Nominations for the prize must be submitted by three sponsors who must present a reasoned set of arguments describing the potential impact of the nominees collective works for the period in question. 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.

Nominations for the PIMS Research prize will be adjudicated by the PIMS Scientific Review Panel.

### PIMS Industrial Outreach Prize

In keeping with the PIMS mandate to strengthen ties and collaboration between mathematical scientists in the academic community and the industrial, business, and government sectors, PIMS will create a prize to recognize individuals who have employed mathematical analysis in the resolution of problems with direct industrial, economic or social impact. This prize is intended for individuals from the academic, private and government sectors. This prize will be given to individuals who at the time of nomination are Canadian citizens or permanent residents of Canada. Nominations for this prize must be submitted by three sponsors, one of whom must be from the private or government organization which benefited from the nominees contribution. These nominations should be forwarded to the PIMS Central Office.

Nominations for the PIMS Industrial Outreach Prize will be adjudicated by a suitable ad hoc committee to be appointed by the PIMS Board of Directors in consultation with the Director of PIMS.

**You are Invited to Visit the Digital Mathematics Archive on the PIMS-UBC Sunsite at http://sunsite.ubc.ca/DigitalMathArchive/**

This archive currently contains:

- *Selected Mathematical Work of Robert Langlands*
- *Oliver Byrne's edition of Euclid's Elements*
- *Publications of Erhard Ratdolt, the First Publisher of Euclid*

PIMS announces the creation of a new Distinguished Chair Programme, which will support one visiting distinguished mathematical scientist per year at each PIMS site. The holder of the chair will visit one of the PIMS universities for at least one month and give a mini-series of lectures. Lectures notes are also to be compiled. PIMS will publish the lecture notes both in print and electronically on the PIMS web site.

Candidates for the PIMS Distinguished Chair at each site will be nominated by the local Site Director in consultation with the local PIMS Advisory Committee. PIMS encourages mathematical scientists at the PIMS sites to forward recommendations to their local Site Director.

Up to $8,000 is being provided by PIMS for each Distinguished Chair. This covers the travel expenses, the local expenses and the honorarium paid to the chair holder. An additional $2,000 will be available to compensate for the preparation of the lectures notes by either a graduate student assistant or by the speaker.

There is no deadline for nominations,; however, site directors are encouraged to submit nominations as soon as possible. The Chair may be taken up at any time.

## National Committee

*Continued from page 1.*

The mandate of the National Committee includes allocation of funds provided by the three institutes to support conferences and workshops in the mathematical sciences across Canada, allocation of funds for the support of activities that are held at the meetings of the three Canadian mathematical science societies (Canadian Mathematical Society, Canadian Applied and Industrial Mathematical Society, Statistical Society of Canada), coordinating the organization of three institute sessions to be held at the meetings of the Canadian Mathematical Society, selecting graduate students to be supported to attend the scientific meetings of the National Societies, and coordinating international programs and other ventures where it is advantageous for the three Institutes to act as a whole. The six member National Committee will consist of a Deputy Director and one member of the scientific advisory panel at each institute.

A call for proposals will be made annually with submitted proposals considered semi-annually (September 15 and March 1). Primary administrative responsibility for the program will rotate between the three Institutes on an annual basis. Submissions will be to the Director of the institute administering the program in that year following the guidelines available on the web site of that institute. For the year April 1, 2000 to March 31, 2001 the three institutes will jointly allocate up to $100,000 for activities under this program.

*Continued from page 1.*

On the morning of the first day six industrial problems were presented by the industrial scientists. Participants then divided into teams to spend the next four days (and nights!) working intensively on the problems, with some persons working on more than one problem. At the end of the week presentations were made by each team. These teams are now busily writing reports detailing their findings; these papers will be bound and widely distributed by PIMS.

Below we list this year's problems and make some comments about the solutions obtained.

**Classification of Chemical Compound Structures (Searle, Chicago):** Searle develops, manufactures, and markets prescription pharmaceuticals and other healthcare solutions. Searle's problem was that of estimating the number of pharmacophores of particular types and, if feasible producing lists of all possible pharmacophores.

The Searle problem was solved. It called for the talents of chemists, mathematicians, and computer scientists; several of each were each was available and it was only by synergy that a solution was obtained. The chemists determined the reasonable distances that sites could attain. The mathematicians estimated the number of possible pharmacophores in general and worked out certain mathematical information that went into the programs. Two programs were written using somewhat different approaches, partly as a double check on the validity of the programs. The Searle representative, Tom Doman, said that his company would certainly make use of the program and of the solution write-up, which he was eagerly awaiting.

**Dynamics of Large Mining Excavators (RSI Technologies, Victoria):** RSI designs and manufactures digital hydraulic-control systems for mobile machinery. Their problem for the workshop was that of providing an alternative mathematical model of the dynamics of large mining excavators, instead of a standard (and much detailed) control theory approach. The group has investigated a neural network approach and experimented with data provided by the company. An important discovery of the group is that the data is insufficient for obtaining a neural net solution since they were collected on lower dimensional sets. The group the developed a neural net solution to a simplified version of the problem and gained much insight into possible solutions for the general problem.

**Contaminant in Water Distribution Systems (Charles Howard and Associates, Victoria):** This firm provides engineering studies and operational analysis of water resource systems. Their problem was that of predicting contaminant flow in a municipal water system, and predicting the source of a contaminant, given readings at various sites.

The C. H. & A problem in the forward direction, the prediction problem, was solved using some clever mathematical modelling that was then fed into previously written computer codes for simulation. The inverse problem, that of determining contaminant source, was shown to be ill-posed (i.e., not admitting a unique solution).

**Quality Control for Multivariable Problems (Chemex Labs, Vancouver):** Chemex labs operates laboratories which specialize in analyzing geological materials such as soil samples, core samples, and rock and drill cuttings. Here the problem was one of quality control. The solution team came up with three distinct approaches to solving the problem, and the company representative expressed interest in pursuing these approaches further.

**Efficient Portfolio Selection (Merak, Calgary):** Merak develops petroleum economic software for oil and gas companies worldwide. Their problem was that of determining the "efficient frontier" of a set of possible portfolios made up of a selection of petroleum projects. This problem also lead to three distinct approaches for its solution, two of which the company had not considered before, but which looked very promising. The company representative was very pleased with the results and is eagerly awaiting the group report.

**Batch Interfaces inside Petroleum Pipelines (Enbridge, Calgary):** Enbridge, Inc. is engaged in the transportation of liquid hydrocarbons and the distribution of natural gas. Their problem was that of estimating the size of a mixing frontier between different types of fluid flowing in a pipeline. This problem had also been used at the Industrial Modelling Camp in the previous week to motivate and prepare graduate students. The team has developed an elegant yet simple mathematical model to estimate the size of this mixing frontier. An analytical similarity solution is obtained and the size of this region was estimated to increase in time $t$ at a rate proportional to $t^{0.5}$. This is in close agreement with the measurements from Enbridge which indicated that the growth rate to be $t^{0.56}$.

Significant progress or insight was made in all six problems and the industry representatives all expressed satisfaction with the outcomes.

This year's Problem Solving Workshop was again sponsored by NSERC and by the BC-Information Science and Technology Agency. PIMS also charges a modest amount for each participating company. The industrial scientists came well prepared with information and preliminary data for testing. *Continued on page 5.*

Most of the industrial scientists stayed the entire time and worked intensively with the teams. In later days some stayed in contact via e-mail or by telephone.

The PIMS industrial graduate workshop and industrial problem solving workshop are examples of the new innovative programs that PIMS is introducing to stimulate university-industry interaction and collaborative research. Backed by seven Western universities, PIMS is able to draw on its 300 members in more than 15 departments to achieve a critical mass for workshops like this one that would be impossible for any one institutions to successfully run. Students attending these workshops are exposed to a new paradigm in research, one that involves working on the full spectrum from theoretical to practical all in one problem.

Faculty participants came from all five of the PIMS founding universities. As well, we attracted faculty from the University of Manitoba, the University of Regina and from many US and British universities. Graduate student participants came from the University of Victoria, the University of Alberta, the University of British Columbia, the University of Calgary, Simon Fraser University, the University of Montreal, the University of Regina, the University of Toronto, and the University of Western Ontario.

PIMS plans to continue the industrial forum next year with the graduate workshop at Simon Fraser University and the Problem Solving Workshop at the University of British Columbia.

## Report on the 2nd PIMS Graduate Industrial Mathematics Modelling Camp

The second PIMS Graduate Industrial Mathematics Modelling Camp, held on the campus of the University of Alberta from May 24 to May 28, 1999, was a big success. PIMS thanks Gordon Swaters (Dept. of Math. Sci., Univ. of Alberta) for organizing this meeting.

The goal of the PIMS Mathematical Modelling Camps is to provide experience in the use of mathematical modelling as a problem solving tool for graduate students in mathematics, applied mathematics, statistics and computer science. This year, we invited all the mentors from local industry or government services to pose problems directly relevant to their organizations.

The problems considered were Geo-Statistical Modelling of Geological Media (**Stefan Bachu, Alberta Geological Survey**), Error Measurer for Uncertainties in Drill-bore Position (**Ian Gilles, Sperry-Sun**), Modelling of a Novel Scheme for Telecommunications Network Synchronization (**Wayne Grover, TRLabs**), Modelling the Deformation and Fracturing of Oil-Sands under Pressure (**Mike Lipsett, Syncrude**), Modelling Missing and Perturbed Half-Tone Dot Images, Pint Quality (**Gordon Leery, Pulp and Paper Research Centre**), Modelling of Ship-to-Plane and Plane-to-Ship Tracking Based on Radar Data (**Elisa Shabazian, Lockheed Martin**

After the Modelling Camp, most of the participants travelled to Victoria to attend the 3rd PIMS Industrial Problem Solving Workshop

## PIMS Summer School in Fluid Dynamics

**August 7–20, 1999**
**University of Alberta**

Organized by Bruce R. Sutherland and T. Bryant Moodie (Department of Mathematical Sciences, University of Alberta) this summer school offers an enriched learning environment in which the theoretical, experimental and computational aspects of fluid dynamics are synthesized. Participants will attend a comprehensive series of lectures, and will be given hands-on experience performing and analyzing experiments in the Environmental and Industrial Fluid Dynamics Laboratory. In addition, they will run numerical simulations using research-level codes. Topics will include fluid dynamics fundamentals, industrial and environmental flows, geophysical fluid dynamics, turbulence modelling and computational fluid dynamics.

**Invited Speakers:**
G. Lawrence, University of British Columbia
P. Morrison, University of Texas at Austin
W. R. Pelletier, University of Toronto

**Core Lecturers:**
A. B. G. Bush, Earth & Atmos. Sciences, UA
J. C. Bowman, Math Sciences, UA
P. D. Minev, Math Sciences, UA
T. B. Moodie, Math Sciences, UA
B. R. Sutherland, Math Sciences, UA
G. E. Swaters, Math Sciences, UA

See *www.pims.math.ca/sections/activities/fdss99.html.*

## Workshop on Computational Graph Theory and Combinatorics: A Report

The PIMS sponsored Workshop on Computational Graph Theory and Combinatorics was held at the University of Victoria, May 6-8. The workshop attracted more than 70 attendees and featured invited talks by three distinguished mathematical scientists. Herbert Wilf (University of Pennsylvania) gave a talk entitled *East-West, a Recursive Package for Generating Combinatorial Families.* Brendan McKay (Australian National University) gave a talk entitled *Generating Representatives of Isomorphism Classes.* Steven Skiena (SUNY Stonybrook) gave a talk entitled *Who is interested in algorithms and why?: lessons from the Stony Brook Algorithms Repository.* In addition Brendan McKay gave a public lecture *The Bible Code: Fact or Fallacy* (partially sponsored by the UVic Lansdowne Fund). There were 30 contributed talks given by speakers from around the world: The countries represented include France, Belgium, Germany, Poland, Australia, and the U. S. A. The workshop was organized by Wendy Myrvold (UVic) and Frank Ruskey (UVic).

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## Theme Meetings

The following theme meetings are planned:

- Theme Workshop for the Financial sector, May 26, 1999, Fields. Organizer: R. Garcia
- Theme Workshop for the Biomedical sector, September 1999, Fields. Organizer: R. Miura
- Theme Workshop for the Commercial-industrial sector, October 1999, CRM. Organizer: A. Gupta & P. Hansen
- Theme Workshop for the Manufacturing sector, January 2000, PIMS. Organizer: A. Peirce
- Theme Workshop in Information Technology, April 2000, Fields. Organizer: E. Kranakis

***Errata:*** In the last PIMS Newsletter an error was made in listing the project members and the industrial partners of the **Biomedical Models of Cellular and Physiological Systems in Disease** MITACS project. The project members should have included E. Puil (UBC). Also, the industrial partners are Kinetek Pharmaceutical, StemCell Technologies, In Silico Inc., and Precision Biochemicals. We regret this error.

## Open Position: A Business Development Specialist for MITACS in Western Canada

**Job Summary:**

As Business Development Specialist, the position will be responsible for developing new collaborative industrial projects and pursue new industrial partners. The position is located at PIMS central office and is also responsible for handling industry proposals, staffing, and monitoring MITACS's industrial accounts for the projects affiliated with PIMS.

**Responsibilities:**

- Promotes research in all areas encompassed by the mathematics sciences.
- Initiates and cultivates opportunities for partnership between researchers and the industry. Works with the Director of PIMS to ensure existing projects remain open to new academic researchers.
- Collaborates with industry officials in exploration and formulation of recommendations on the feasibility of joint initiatives. Identifies and develops new research projects.
- Works with University Industrial Liaison Offices in evaluating and negotiating joint venture agreements to support collaborative research including research contracts, transfer agreements and nondisclosure agreements.
- Plans and develops marketing strategies to promote awareness of MITACS by writing articles and making presentations to individuals and groups.
- Initiates and leads meetings with project leaders in identifying trends and planning for future research projects.
- Develops and facilitates industrial open houses, seminars, workshops, and short courses to promote research in mathematical sciences.
- Works closely with the Director of PIMS to ensure the overall success of MITACS projects.
- Is responsible for the financial and scientific reporting processes required for MITACS. Is responsible for monitoring the progress of the various researches and prepares news releases on any major breakthrough of the researches.
- Is responsible for the administrative processes of the various MITACS related tasks at PIMS sites (UBC, SFU, U. of Victoria, U. of Alberta, and U. of Calgary).

**Qualifications:**

Post secondary education in mathematics sciences (mathematics, statistics, computer science or related field). Four to six years of experience in marketing, industry liaison, and research contract development. Ability to interact with senior level academic, business, government and community leaders. Ability to simultaneously manage a diverse range of projects and activities within a diverse organization. Enthusiasm and creativity are essential when seeking out new partners and project proposals.

# Mathematical Biology

## PIMS at University of British Columbia

### Co-sponsored by the Natural Sciences and Engineering Research Council of Canada

**Organizers:** Robert M. Miura (Chair of the Organizing Committee, University of British Columbia), Fred Brauer (University of Wisconsin and University of British Columbia) Leah Keshet (University of British Columbia), Yue-Xian Li (University of British Columbia), Marc Mangel (University of California at Santa Cruz), David Sankoff (Université de Montréal), Gerda de Vries (University of Alberta), Michael Waterman (University of Southern California)

The current Thematic Programme in Mathematical Biology consists of five workshops, each two weeks long. The workshops are organized around a core of extensive lectures give by experts in the field. These lectures are intended to be accessible to graduate students and mathematical scientists outside the field. Complementing the core lectures are more informal seminars given by participants. These core lectures are listed below for each of the five workshops. PIMS would like to thank the organizers for the excellent work that they did in assembling such a strong programme of lectures, representing the latest developments in the field.

For additional information, see the web site *www.pims.math.ca/sections/activities/bio.html.*

## Workshop on Mathematical Genomics

### May 31 – June 11, 1999

**David Baillie** (Department of Biochemistry and Biosciences, Simon Fraser University): *Some Surprises from Genome Sequencing*

**Nadia El-Mabrouk** (Departément d'Informatique, Université de Montréal: *Genome Reconstruction*

**Joseph Felsenstein** (Department of Genetics, University of Washington): *Phylogenies and Likelihoods* and *Coalescents and Likelihoods*

**Terry Gaasterland** (Laboratory of Computational Genomics, Rockefeller University): *Biological Databases* and *Comparative Genomics*

**Philip Green** (Department of Molecular Biotechnology, University of Washington): *Sequence Assembly* and *Sequence Searches*

**Thomas Hagedorn** (Department of Mathematics & Statistics, College of New Jersey) *An Introduction to Phylogenetic Invariants*

**Steven Henikoff** (Fred Hutchinson Cancer Research Center, University of Washington): *Protein Family Databases*

**Philip Hieter** (Department of Molecular Medicine & Therapeutics, University of British Columbia): *Genome Analysis and Human Biology*

**Susan Holmes** (Department of Statistics, Stanford University): *Introduction to the Bootstrap* and *Bootstrap and Evolutionary Trees*

**Lee Hood** (Department of Molecular Biotechnology, University of Washington): *Biology and Computation*

**Richard Karp** (Department of Computer Science & Engineering, University of Washington): *Physical Mapping* and *Expression Arrays*

**John Kececioglu** (Department of Computer Science, University of Georgia): *Physical Mapping* and *Multiple Alignment*

**Gene Myers** (Algorithm Development, Celara Genomics Corporation): *Assembling Sequences* and *Advanced Search Techniques*

**David Sankoff** (Centre de Recherches Mathématiques, Université de Montréal): *Comparative Mapping*

**Gary Stormo** (Department of Molecular, Cellular and Biology, University of Colorado, Boulder): *Gene Regulation I* and *Gene Regulation II*

**Elisabeth Tillier** (Department of Molecular & Medical Genetics, University of Toronto): *RNA Structure and Evolution*

**Michael Waterman** (Department of Biological Sciences, University of Southern California): *Introduction to the Programme*

# Workshop on Mathematical Physiology

## June 14–25, 1999

**Richard Bertram** (Pennsylvania State University): *Physiology and Methods of Modelling in the Synapse I* and *Physiology and Methods of Modelling in the Synapse II*

**Bard Ermentrout** (Department of Mathematics, University of Pittsburgh): *From Bower's House to Our House: How to Reduce Complex Neural Models to Simpler Dynamical Systems I*, *From Bower's House to Our House: How to Reduce Complex Neural Models to Simpler Dynamical Systems II* and *Synaptic Bistability, Waves, and Bumps in Networks of Excitatory and Inhibitory Cells*

**Diane Finegood** (School of Kinesiology, Simon Fraser University): *Investigating Beta-Cell Dynamics with a Mass Balance Equation*

**Leon Glass** (Department of Physiology, McGill University): *Resetting and Entraining Biological Oscillators*, *Dynamics of Cardiac Arrhythmias* and *Controlling Cardiac Arrhythmias*

**Jim Keener** (Department of Mathematics, University of Utah): *Mathematical Modelling of Cardiac Electrical Activity* and *Mechanisms of Defibrillation*

**Yue-Xian Li** (Department of Mathematics and Zoology, University of British Columbia): *Introduction to Intracellular* $Ca^{2+}$ *Oscillations and Waves*, *Interaction Between Intracellular* $Ca^{2+}$ *Handling and Plasma Membrane Electrical Activity* and *Tango Waves*

**John Milton** (University of Chicago): *Delay Equations (Delayed Feedback)* and *Multistability in the Nervous System*

**Mark Pernarowski** (Department of Mathematical Sciences, Montana State University): *Partial Differential Equation Models of Coupled Bursters* and *Control and Parameter Identification in Excitable Cell Models*

**John Rinzel** (Courant Institute of Mathematical Sciences, New York University): *Nonlinear Dynamics of Neurons and Networks* and *Rhythms and Waves in the "Sleeping" Thalamic Slice*

**Arthur Sherman** (NIDDK/MRB, University of Wisconsin): *Roles of Endoplasmic Reticulum in Excitable Cells* and *The Phantom Model for Beta-Cell Bursting*

**Dan Tranchina** (Courant Institute of Mathematical Sciences, New York University): *Mathematical Aspects of Vision I*, *Mathematical Aspects of Vision II* and *Population Density Methods for Large-Scale Neural Network Modelling: Applications to Visual Cortex*

**Gerda de Vries** (Dept. of Mathematical Sciences, Univ. of Alberta): *Introduction to Models of Bursting Electrical Activity in Pancreatic Beta Cells*, *Classification of Bursters* and *Coupling of Beta-Cells: Effects of Noise and Heterogeneity*

## July 19–30, 1999

**Linda Allen** (Department of Mathematics, Texas Tech. University): *Some Stochastic SIS Models, Occurence, Duration and Size of an Epidemic in Deterministic and Stochastic SI and SIS Models* and *An Age Structured Model for Canine Rabies*

**Frank Ball** (Department of Mathematics, Nottingham University): *Coupling Methods in Epidemic Theory, Stochastic and Deterministic Models for SIR and SIS Epidemics Among a Population Partitioned into Households* and *Statistical Inference for SIR Epidemics Among a Population of Households*

**Sally Blower** (Department of Microbiology & Immunology, University of California, San Francisco): *Health Policy Modelling: Epidemic Control, HIV Vaccines and Risky Behaviour*, *Antiviral and Antibiotic Resistance: Prediction and Control* and *Tuberculosis: From Historical Epidemiology to the Present Day*

**Fred Brauer** (Department of Mathematics, University of British Columbia): *A Quick Overview of the Workshop* and *What is Mathematical Epidemiology All About?*

**Carlos Castillo-Chavez** (Biometrics Unit, Cornell University): *Cross-immunity and Coevolution in Epidemiology*, *Modelling Contact Structures in Biology and Their Application to the Dynamics of HIV Among Prostitution in Tijuana, Mexico* and *Potential Mechanisms for Disease Evolution: The Case of the Re-emergence of Tuberculosis*

**Pauline van den Driessche** (Department of Mathematics & StatisticsUniversity of Victoria): *Time Delay in Epidemic Models* and *Epidemic Model with Maturation Delay*

**David Greenhalgh** (Department of Statistics and Modelling Science, University of Strathclyde): *The Effect of Heterogeneity on the Spread of HIV Amongst Intravenous Drug Injectors* and *The Use of Stochastic Processes in Mathematical Epidemiology*

**Karl Hadeler** (Biomathematik, Universität Tübingen): *The Standard Kermack-McKendrick Model: The Role of $R_o$ and of Maximal Prevalence*, *Competing Virus Strains, Changing Parasites, Superinfection and Applications to Dengue Fever and Trypanosoma*, *Epidemics in Pair Formation Models With Infectivity Depending on Age Since Infection*, *Vaccination and Its Influence on the Basic Reproduction Number* and *Backward Bifurcation in Epidemic Disease Models*

**Herbert Hethcote** (Department of Mathematics, University of Iowa): *Three Basic Epidemiological Models*, *Age-structured Models for Pertussis (Whooping Cough)*, *Epidemiology Models With Variable Population Size*, *Periodicity in Epidemiology Models I* and *Periodicity in Epidemiology Models II*

**John Hsieh** (University of Toronto): *Stochastic Inference of Vaccine Efficacy and Vaccine Fraction*

**Valerie Isham** (Department of Statistical Science, University College London): *Overview of Stochastic Epidemic Models I. Overview of Stochastic Epidemic Models II* and *Stochastic Models for Aggregation in Macroparasite Infections*

**Christopher Kribs-Zaleta** (University of Texas, Arlington): *Two to tango: two-sex models for sexually transmitted diseases* and *Center manifolds and normal forms in epidemic models*

**Alan S. Perelson** (Theoretical Biology & Biophysics, Los Alamos National Laboratory): *TBA*

**Matt Schuette** (University of Iowa): *Modelling the Effects of Varicella Vaccination Programs*

**James Watmough** (Department of Matnematics, University of Victoria): *Multiple Steady States in an SIS Model with a Nonlinear Contact Rate*

# Workshop on Mathematical Ecology

## August 2–13, 1999

**Fred Adler** (Department of Mathematics, University of Utah): *Metapopulations, Coexistence, and the Evolution of Virulence, Part I* and *Metapopulations, Coexistence, and the Evolution of Virulence, Part II*

**Michael Doebeli** (Department of Zoology & Mathematics, University of British Columbia): *Adaptive Dynamics, Evolutionary Branching, and Sympatric Speciation*

**Greg Dwyer** (Department of Ecology & Evolution, University of Chicago): *TBA*

**Shea Gardner** (NERC Centre for Population Biology, Imperial College at Silwood Park): *Matrix Methods in Ecology* and *Examples of Matrix Methods Applied in Conservation and Management*

**Don Ludwig** (Department of Zoology & Mathematics, University of British Columbia): *Optimal Phosphorus Loading of a Lake that Possibly Has Several Stable Equilibria*

**Bernard Luttbeg** (School of Forestry & Environmental Studies, Yale University): *Information as a State Variable* and *The Effects of Flexible Behavior and Imperfect Perception on Predator-prey Dynamics*

**Marc Mangel** (Department of Environmental Studies, University of California, Santa Cruz): *Welcome and Introductions* and *On the Need For Dynamic State Variable Models in Conservation Biology* and *Models For the Ecology of Aging and the Evolution of Aging*

**Jonathan Newman** (Department of Zoology, Southern Illinois University): *The Use of Large Dynamic Systems Models in Ecology* and *Modelling the Effects of Climate Change on Plant-animal Interactions: A Dynamic Systems Approach*

**Bernard D. Roitberg** (Simon Fraser University): *Misinformation As a Second Line of Defense*

# Workshop on Mathematical Cell Biology

## August 16–27, 1999

**Dean Bottino** (Department of Mathematics, University of Utah): *TBA*

**Micah Dembo**( Department of Biomedical Engineering, Boston University): *Investigations of Cytokinesis and Cell Motility*

**Evan Evans** (Department of Physics, University of British Columbia): *Dynamic Strength of Molecular Bonds and Consequences for Cell motility*

**Byron Goldstein** (Department of Mathematics & Statistics, University of New Mexico): *Cell Signalling through Aggregating Receptor Systems: An Introduction* and *An Introduction to Biosensors*

**Peter Lansdorp**: *Stem Cells*

**Joe Mahaffy** (Department of Mathematical Sciences, San Diego State University): *Models of hematopoeisis*

**Alex Mogilner** (Department of Mathematics, University of California, Davis): *An introduction to Cell Motility*

**Garett Odell** (Department of Zoology, University of Washington): *Cytoskeletal interactions between microtubules, F-actin, and myosin II*

**George Oster** (University of California, Berkeley): *Recent Advances in Cellular Biology: Models, experiments, and Synthesis*

**Jamie Piret** (Biotechnology Laboratory and Department of Microbiology & Immunology, University of British Columbia): *Hematopoeisis*

**Lee Segel** (Department of Applied Mathematics, Weizmann Institute): *On the role of feedback in promoting conflicting goals of the adaptive immune system*

**Carla Wofsy** (Department of Mathematics & Statistics, University of New Mexico): *Modelling Receptor Aggregation* and *Early Events in Cell Signaling through Immunoreceptors: Modelling and Experiments*

| | |
|---|---|
| During the Year | PIMS Distinguished Lecturer Series |
| During the Year | PIMS/MITACS Industrial Working Seminar Series, University of British Columbia & Simon Fraser University |
| February 15 | **Deadline for nomination for PIMS Postdoctoral Fellowships** |
| February 19–20 | Changing the Culture II: Narrowing the Gap, SFU Harbour Centre |
| February 25 | Alternative Math Education Evening, Roger's Elementary School |
| February 26–28 | MITACS Workshop in Prediction in Interacting Systems, University of Alberta |
| March 8–12 | Workshop on Interactive Measure-Valued Processes, Fields Institute |
| April 15 | **Deadline for applications for the Spring call for Scientific Proposals** |
| May 6–8 | PIMS Workshop on Computational Graph Theory and Combinatorics, University of Victoria |
| May 17–28 | MITACS Workshop on Droplet Migration, University of British Columbia & Simon Fraser University |
| May 20–24 | The $27^{\text{th}}$ Canadian Operator Theory and Operator Algebras Symposium, University of Prince Edward Island |
| May 24–28 | AARMS Combinatorics at CMS Summer Meeting, Memorial University |
| May 24–28 | $2^{\text{nd}}$ PIMS Graduate Industrial Mathematics Modeling Camp, University of Alberta |
| May 28 | PIMS Executive Meeting, Edmonton |
| May 29 | PIMS Board Meeting, Edmonton |
| May 31 – June 4 | $3^{\text{rd}}$ PIMS Industrial Problem Solving Workshop, University of Victoria |
| May 31 – June 11 | PIMS Thematic Programme: Mathematical Genomics Workshop, University of British Columbia |
| June 9 | CACR Information Security Workshop, Simon Fraser University at Harbour Center |
| June 14–25 | PIMS Thematic Programme: Mathematical Physiology Workshop, University of British Columbia |
| June 14–18 | Householder Symposium XIV, Chateau Whistler, British Columbia |
| June 16–20 | First Canadian Conference on Nonlinear Solid Mechanics, University of Victoria |
| June 19 | First Annual PIMS Elementary Grades Math Contest, UBC |
| June 23–25 | PIMS Workshop on Smoothing Applications, University of British Columbia |
| June 27 – July 18 | PIMS Mini-programme: Geometric Functional Analysis, University of British Columbia |
| June 30 – July 3 | PIMS Conference in Convex Geometric Analysis, University of British Columbia |
| July 18–22 | PIMS Workshop on Invariants of Three-manifolds, Nakota Lodge, Morley, Alberta |
| July 19–30 | PIMS Thematic Programme: Mathematical Epidemiology Workshop, University of British Columbia |
| July 26 – Aug. 6 | Seminaire de Mathématiques Supérieures Integrable Systems: From Classical to Quantum, U. de Montréal |
| July 26 – Aug. 11 | International Conference on Valuation Theory, University of Saskatchewan |
| July 28–31 | International Symposium on Symbolic and Algebraic Computation, Simon Fraser University Harbour Centre |
| August 2–13 | PIMS Thematics Programme: Mathematical Ecology Workshop, University of British Columbia |
| August 2–20 | Frontiers of Mathematical Physics Summer Workshop on Particles, Fields and Strings, University of British Columbia |
| August 9–21 | First Annual PIMS Summer School in Environmental and Industrial Fluid Dynamics, University of Alberta |
| August 11–14 | Workshop on Algorithms and Data Structures, Simon Fraser University at Harbour Center |
| August 15–18 | $11^{\text{th}}$ Canadian Conference on Computational Geometry, University of British Columbia |
| August 16–27 | PIMS Thematic Programme: Mathematical Cellular Biology Workshop, University of British Columbia |
| August 23–28 | First $3 \times 3$ Canada-China Math Congress, Tsing Hua University, Beijing |
| August 24–28 | $10^{\text{th}}$ International Workshop and Conference In Stochastic Geometry, Stereology & Image Analysis, University of Calgary |
| September 15 | **Deadline for applications for the Fall call for Scientific Proposals** |
| September 15 | **Deadline for submissions to the National Programme** |
| September 26–28 | International Workshop on Analysis of Vibrating Systems, Cranmore, University of Alberta |
| October | $24^{\text{th}}$ Cascade Topology Seminar, University of British Columbia |
| October 16–17 | West Coast Operator Albegra Symposium, University of Victoria |
| December | PIMS Board Meeting, Vancouver |
| December 11–13 | CMS-PIMS Mathematical Physics Session, CMS Winter Meeting, Montréal |

## 1999–2000

Nineteen postdoctoral fellowships from among 54 applications were awarded for the academic year 1999/2000. The selection was made this year by David Boyd (Chair), Nick Pippenger (UBC), Charmaine Dean (SFU), Robert Moody (U. Alberta), Rex Wesbrook (U. Calgary) and Pauline van den Driessche (U. Victoria).

**Ricardo Carretero**
Department of Mathematics and Statistics, SFU
Sponsor: Keith Promislow

**Michael Segal**
Department of Computer Science, UBC
Sponsors: David Kirkpatrick, Jack Snoeyink

**Sujin Shin**
Department of Math. and Statistics, UVic
Sponsors: Christonpher Bose, Ian Putnam

**Konstantin Zarembo**
Department of Physics, UBC
Sponsor: Gordon Semenoff

**Alexandra Chavez-Ross**
Department of Mathematics
Sponsor: Leah Keshet, Robert Miura

**Madhu Nayakkankuppam**
Department of Mathematics
Sponsors: Philip Loewen, Jonathan Borwein, Rene Poliquin

**Ulrike Stege**
Department of Computer Science, UVic
Sponsors: Mike Fellows, Wendy Myrvold, Valerie King

**Bret Stevens**
Department of Mathematics and Statistics, SFU
Sponsor: Brian Alspach

**Ladislav Stacho**
School of Computer Science, SFU
Sponsor: Tom Shermer

**Siva Athreya**
Department of Mathematics, UBC
Sponsors: Edwin Perkins, Martin Barlow, John Walsh

**Igor Fulman**
Department of Mathematics, UCalgary
Sponsors: B.A. Brenken, Michael Lamoureux

**Brad McNeney**
Department of Mathematics and Statistics, SFU
Sponsor: Charmaine Dean

**Tahir Choulli**
Department of Mathematics, UCalgary
Sponsor: Larry Bates

**Gengsheng Qin**
Department of Mathematics, UVic
Sponsor: Mon Tsao

**Sam Lightwood**
Department of Mathematics, UVic
Sponsors: Christopher Bose, Ian Putnam

**Miro Powojowski**
Department of Geography, UCalgary
Sponsor: Laurence Bentley

**Ioan Bucataru**
Department of Mathematics, UAlberta
Sponsor: Peter Antonelli

**Bert Wiest**
Department of Mathematics, UBC
Sponsor: Dale Rolfsen

## Applications

**June 23–25, 1999**
**University of British Columbia**

Organized by Nancy Heckman (Department of Statistics, UBC), this workshop is centred around the presentation and discussion of several data sets whose analysis involves state of the art smoothing methodology. Some of the analysis is preliminary, and is intended to spark discussion and new research in the area. There will also be contributed talks and a computer demonstration of the Splus suite of functions FUNFITS. FUNFITS was developed by Doug Nychka for the analysis of spatial data. Jim Ramsay (McGill) will give his thoughts on the important directions in smoothing research. The audience will be diverse, including specialists in smoothing applications, statisticians who are not experts in smoothing, and non-statisticians who would like to apply smoothing to questions in their subject area.

**The Data Sets:**

**Variable Stars (organizer: John Rice, UC Berkeley):** How do you estimate light intensity emitted from stars in a somewhat periodic pattern? The data set is large, but observations are not regularly spaced.

**Air Pollution and Asthma (organizer: Kiros Berhane, University of Southern California):** How do you assess the impact of air pollution on lung growth in asthmatic and non-asthmatic children? The data are longitudinal, and can be analyzed via a generalized additive model.

**Mortality Curves of Medflies (organizers: Jane-Ling Wang and Hans Mueller, UC Davis):** Different groups of medflies will have (possibly) different mortality rates. However, the mortality curves will share some similar shape. How can you use information across groups and within groups to accurately estimate/compare mortality curves? The methodology used is a kind of Functional Data Analysis.

**Weather Data (organizer: Doug Nychka):** Doug Nychka has a long history of developing smoothing methodology for large complicated data sets having a spatial and temporal component. He is currently Project Leader of the Geophysical Statistics Project at the National Center for Atmospheric Research in Boulder, Colorado. He'll discuss some of the challenges of data sets associated with that project.

To date over 50 participants have registered for this workshop, which is promising to be a big success. For more information, consult the workshop website at *www.pims.math.ca/sections/activities/smoothing99.html.*

## PIMS at UBC, June 17 – July 18, 1999

Geometric Functional Analysis is concerned with geometric and linear properties of finite- and infinite-dimensional convex bodies. General framework and deep geometric, probabilistic and combinatorial methods developed here are used in many areas outside the field, in Analysis, Geometry and many others.

Over the recent years, Geometric Functional Analysis noted several significant accomplishments. Marked by two Fields Medals by J. Bourgain (1994) and T. Gowers (1998); the Plenary Address at the 1996 European Congress of Mathematics by V. Milman, and two Plenary Addresses at the 1998 International Congress of Mathematicians by G. Pisier and M. Talagrand. Also, 4 invited lectures at the last two Congresses (Gowers, Odell-Schlumprecht, Milman, Tomczak) represented the spectrum of achievements from geometric purely infinite dimensional phenomena to high dimensional ones.

This workshop will bring the top researchers in the field together to exchange new ideas and present their recent results. Young researchers, postdocs and advanced Ph. D. students are also encouraged to attend. An emphasis will be placed on encouraging interactions between young researchers and the senior mathematicians attending the meeting.

**Participants Include:** Semyon Alesker (Université Paris VI and Tel Aviv University), Dan Amir (Tel Aviv University), George Androulakis (Texas A & M University), Spiros Argyros (University of Athens), Wojciech Banaszczyk (University of Lodz), Franck Barthe (Université de Marne-la-Vallee), Sergey G. Bobkov (Syktyvkar University), Jean Bourgain (IAS, Princeton), Apostolos Giannopoulos (University of Crete), Efim D. Gluskin (Tel Aviv University), Yehoram Gordon (Technion), W. Timothy Gowers (Cambridge University), Michail Gromov (IHES and Courant Institute), Olivier Guedon (Paris VI), Petr Hajek (Texas A & M University), William B. Johnson (Texas A & M University), Nigel Kalton (University of Missouri), Hermann Koenig (Universität Kiel), Alex Koldobsky (University of Texas at San Antonio), Rafal Latala (Warsaw University), Joram Lindenstrauss (Hebrew University), Alexander Litvak (Univ of Alberta), Piotr Mankiewicz (Polish Academy of Sciences), Mathieu Meyer (Université de Marne-la-Vallee), Pierre Milman (University of Toronto), Edward Odell (University of Texas at Austin), Timur Oikhberg (University of Texas at Austin), Krzysztof Oleszkiewicz (Warsaw University), Alain Pajor (Université de Marne-la-Vallee), Gilles Pisier (Université Paris VI and Texas A & M University), Aleksander Pelczynski (Polish Academy of Sciences), Shlomo Reisner (Haifa University), Haskell P. Rosenthal (University of Texas at Austin), Mark Rudelson (University of Missouri), Gideon Schechtman (Weizmann Institute of Sciences), Thomas Schlumprecht (Texas A & M University), Carsten Schuett (Universitaet Kiel), Stanislaw Szarek (Université Paris VI), Michel Talagrand (Ohio State University), Antonis Tsolomytis (University of the Aegean), Elisabeth Werner (Case Western Reserve University)

### Conference in Convex Geometric Analysis

**June 30 – July 3, 1999**

Associated with the mini-programme is a conference in honour of Vitali Milman's $60^{th}$ birthday. This conference is directed to a wider audience and will have a broader scientific content than the workshop.

**Scientific Committee:**

Jean Bourgain (IAS, Princeton)
Timothy Gowers (Cambridge University)
Michail Gromov (IHES and Courant Institute)
Gilles Pisier (Université Paris VI and Texas A & M)
Nicole Tomczak-Jaegermann (Univ. of Alberta)

**Plenary Speakers Include:**

**Semyon Alesker** (Univ. Paris VI and Tel Aviv Univ.),
**Sergey G. Bobkov** (Syktyvkar University),
**Jean Bourgain** (IAS, Princeton),
**Nassif Ghoussoub** (University of British Columbia),
**Apostolos Giannopoulos** (University of Crete),
**W. Timothy Gowers** (Cambridge University),
**Michail Gromov** (IHES and Courant Institute),
**William B. Johnson** (Texas A&M University) or
**Gideon Schechtman** (Weizmann Inst. of Sciences),
**Nigel Kalton** (University of Missouri),
**Joram Lindenstrauss** (Hebrew University),
**Pierre Milman** (University of Toronto),
**Vitali Milman** (Tel Aviv University),
**Edward Odell** (University of Texas at Austin) or
**Thomas Schlumprecht** (Texas A&M University),
**Gilles Pisier** (Univ. Paris VI and Texas A&M Univ.),
**Nicole Tomczak-Jaegermann** (Univ. of Alberta)

# Tsinghua University, August 23–28, 1999

This congress will be the starting point for the establishment of scientific collaboration between the two countries and to provide clear directions for specific future projects in the mathematical sciences.

## Organizing Committee

D. Cai (Director, Math Institute, Tsing Hua University)
K. C. Chang (President, Chinese Mathematical Society)
L. Peng (Director, Math Institute, Beijing University)
X.-W. Zhou (Director, Math Institute, Nankai University)
D. Dawson (Director, Fields Institute for Math. Sci.)
N. Ghoussoub (Director, Pacific Institute for Math. Sci.)
S. Halperin (Program Leader, MITACS)
R. Kane (President, Canadian Mathematical Society)
L. Vinet (Director, Centre de Recherches Mathématiques)

## Canadian Plenary Speakers

**Representation Theory:** Jim Arthur (University of Toronto)
**Number Theory:** John Friedlander (University of Toronto)
**Probability:** Don Dawson (Fields Institute)
**Analysis:** Nicole Tomczak-Yaegermann (University of Alberta)
**Geometry:** Francois Lalonde (Univ. du Québec à Montréal)

## Mini-courses in Emerging Areas of Mathematics

**August 30 – September 4**

**Interface Motion for Reaction-diffusion Equations in Materials Science and Math Biology:** Michael Ward (Dept. of Mathematics, UBC)
**Cryptography:** Ruizhong Wei (Centre for Applied Cryptography, University of Waterloo)
**Mathematical Finance:** L. Seco (Dept. of Mathematics, University of Toronto)

## Scientific Sessions

### Partial Differential Equations

Nassif Ghoussoub (Pacific Institute for the Math. Sci.)
Changfeng Gui (Dept. of Mathematics, UBC)
Nicky Kamran (Dept. of Mathematics & Statistics, McGill)
Paul Gauthier (Math. et Stat., Univ. du Montréal)
George Bluman (Pacific Institute for the Math. Sci.)

### Differential Geometry

Jacques Hurtubise (Dept. of Mathematics & Statistics, McGill)
John Bland (Dept. of Mathematics, Univ. of Toronto)
JingYi Chen (Dept. of Mathematics, UBC)
Patrick Ryan (Dept. of Math. & Statistics, McMaster Univ.)

### Representation Theory

Jim Carrell (Dept. of Mathematics, UBC)
Bram Broer (Mathématiques et Statistique, Univ. du Montreal)
Alfred Weiss (Dept. of Math. Sciences, Univ. of Alberta)
Arturo Pianzola (Dept. of Math. Sciences, Univ. of Alberta)
Kai Behrend (Dept. of Mathematics, UBC)

### Probability

John Walsh (Dept. of Mathematics, UBC)
Shui Feng (Dept. of Math. & Statistics, McMaster)
Tom Salisbury (Dept. of Math. & Statistics, York University)
Jeremy Quastel (Dept. of Mathematics, Univ. of Toronto)
Byron Schmuland (Dept. of Math. Sciences, Univ. of Alberta)

### Computational/ Numerical Analysis

Brian Wetton (Dept. of Mathematics, UBC)
Uri Ascher (UBC)
Bob Russell (Dept. of Mathematics & Statistics, SFU)
Michel Fortin (Dept. de Math. et Statistique, Université Laval)
Herman Brunner (Dept. of Math. & Statistics, Memorial)

### Combinatorial Optimisation

B. Alspach (Dept. of Mathematics & Statistics, SFU)
K Heinrich (Dept. of Mathematics & Statistics, SFU)
Penelope Haxell (Comb. & Opt. Dept., Univ. of Waterloo)
David Wagner (Comb. & Opt. Dept., Univ. of Waterloo)
Arvind Gupta (Computer science, SFU)

### Topology (Geometric and Low-dimensional)

Steve Boyer (Mathématiques, Univ. du Quebec á Montreal)
Dale Rolfsen (Dept. of Mathematics, UBC)
Xingru Zhang (Dept. of Mathematics, SUNY at Buffalo)
Richard Kane (Dept. of Math., Univ. of Western Ontario)
Eddy Campbell (Dept. of Math. & Statistics, Queen's Univ.)

### Operator Theory/Functional Analysis

George Elliott (Dept. of Mathematics, University of Toronto)
Andrew Dean (Fields Institute)
Guihua Gong (Fields Institute)
Masoud Khalkhali (Dept. of Math., Univ. of Western Ontario)
James Mingo (Dept. of Math. & Statistics, Queen's Univ.)
Thierry Giordano (Univ. of Ottawa)

### Dynamical Systems

Bill Langford (Fields Institute)
Sue Ann Campbell (Dept. of Applied Math., Univ. of Waterloo)
Shigui Ruan (Dept. of Mathematics & Statistics, Dalhousie)

## Linkages Between Math and Industry

This session consists of panel discussions by Canadian and Chinese leaders in science and technology. Canadian mathematical scientists will present five examples of the Canadian experience in technology transfer of mathematical sciences.

- A success story of mathematics in industry: Montreal CRT/Shanghai Public Transportation Project
- Combinatorial Optimisation and the scheduling of airplanes: W. Pulleyblank (Math. Sciences Department, IBM T. J. Watson Labs)
- Applications of Mathematics in the Mining and Resource Industry: Anthony Peirce (Dept. of Mathematics, UBC)
- Signal Processing and Wavelets: Jean-Marc Lina (Centre de Recherches Mathématiques)
- Fluid Dynamics and Fuel Cells: H. Huang (Dept. of Mathematics & Statistics, York University)

## University of Alberta, June 19 – July 14, 2000

This thematic programme will concentrate on three areas: groups and their representations, Lie theory, and the mathematics of aperiodic order. The programme will incorporate both an instructional and research components in each of the three broad areas.

Each area will be featured for a two week period and will have lecturers of international stature. The first week of each area will be a school devoted to a series of introductory lectures, aimed at giving the students an introduction to the subject in question. Graduate students, recent Ph. D.'s, and advanced honours students are encouraged to participate in these sessions. The second week will be a research level workshop and will welcome additional researchers and students who wish to participate.

**Lie theory Session:**

Canada has a strong representation in the algebraic side of Lie theory. This thematic programme will serve to maintain Canada's visibility in the international Lie theory community. The timing of this event is designed to coordinate with semester at the Fields Institute on infinite dimensional Lie theory during the fall of 2000.

The main lecturers confirmed to date are:

Geogia Benkart (Madison), *Infinite Dimensional Lie Theory*
Stephen Donkin (QMW London), *Algebraic Groups*

**Group Theory Component:**

Groups play a central role in just about all the branches of mathematics and continue to be a very active area of research as evidenced by the recent Field Medals awarded in the area.

At present we have the culmination of a three directional attack on the Burnside problems. The first consists of the geometric methods of Ol'Shanskii in producing finitely generated groups of finite exponent that are infinite (a vast improvement of Adian's construction which is one of the technically most difficult piece of work of over 300 pages!). The second is the positive solution of the restricted Burnside Problem for residually finite groups by Zelmanov, and the third is the p-adic analytic methods in dealing with questions of linearity of residually finite groups by Alex Lubotzky and Avinoam Mann. There are also the remarkable advances made by Aner Shalev, Lubotzky, and others on pro-finite groups and results of Dan Segal and others for residually finite solvable groups.

Representation theory continues to be of fundamental importance in mathematics and other sciences. There has been much recent progress, especially, on the representation theory of finite groups of Lie type, which ties together the Lie theory and group theory themes of the program. Modular representation theory is also an area of considerable activity.

The conference will present an excellent opportunity to get a broad picture of these manifold activities as told by the masters themselves to our graduate students and new Ph. D.'s. All main talks will be of the "colloquium" nature, reserving specialized talks for the afternoon sessions meant for the experts.

The main lecturers confirmed to date are:

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

**Aperiodic Session**

The course aims to provide the students with the background to understand the main ideas being used at present in the development of the mathematics of aperiodic order. One of the appealing aspects of this subject is the way in which it draws together a number of diverse subdisciplines of mathematics: discrete geometry, algebra, analysis, and measure theory and topological dynamics. For this reason the instructional part will be given by three or four speakers. It is our intention to give the students a reasonable feel for main ideas and to provide sufficient background and lots of pointers so that they may pursue it more deeply later on.

The second week of the programme will focus on the most recent developments. We plan still to keep the pedagogical spirit and it is hoped that a number of the more interested students will stay on. We have already seen considerable interest in this event by other research workers in the mathematical and physical aspects of aperiodic order, and we anticipate that this will be a very productive research oriented meeting.

The main lecturers confirmed to date are:

Jeff Lagarias (AT & T Research Labs)
Boris Solomyak (Washington State U.)
Michael Baake (U. Tübingen)

**Thematic Programme Schedule**

| June 19–23 | June 26–30 | July 3–7 | July 10–14 |
|---|---|---|---|
| Lie School | Lie Workshop<br>Groups School | Groups Workshop<br>Aperiodic School | Aperiodic Workshop |

# PIMS in the Elementary Schools: Three Recent Workshops

**Alternative Math Evenings:** These are semiannual events (spring and fall) organized by **Kelly Choo** (PIMS Education Coordinator, UVic), with a team of volunteers made up of faculty members, grad students, people from the community, and more recently, undergrads wishing to become elementary school teachers. This year, the first one was held at Roger's Elementary on February 25 (cf. the PIMS website for details), the next one will take place at Sidney Elementary in the fall. PIMS will try to organize similar events on the Mainland in the future.

**Pamela Hagen's award winning Math Unplugged** at Westwood Elementary in Coquitlam is just as playful, and just as serious. It is an annual event, sponsored by PIMS, which took place for the third time this April 30. After an elegant and greatly appreciated keynote address by **Kathy Heinrich,** the 4 blocks of remaining school time were filled by participation in 4 out of 20 different workshops, ranging from Tangram Puzzles to Magic Mud. For the teachers, a by-product of this collective concentration on an often dreaded subject was a marvellous strengthening of their *esprit de corps.*

**Math workshop at West-Dalhousie Elementary, Calgary:** The unexpected usefulness of mathematics as social mortar was also noticeable in the math workshop which filled an entire professional day (May 3) at West-Dalhousie Elementary in Calgary. Under the leadership of their principal **Judy Gray,** the teachers of that school have set themselves the task of developing a *perspective* on mathematics (as they have on other subjects), to give coherence and momentum to their teaching. At their request, PIMS supplied a mathematician to lead their workshop and help anchor their discussions. The event was so well received that a repeat is planned for next year.

The contact between PIMS and West-Dalhousie was made through *MathWorks*, a remarkable experiment in professional development, invented and maintained by **Sharon Friesen,** a Calgary middle school teacher (and recent winner of the Prime Minister's Teaching Award) with a long-standing connection to the local PIMS team. Attended by teachers from several schools, each monthly meeting of MathWorks is built around a math workshop, which, whenever possible, involves a mathematician — usually from PIMS.

## New Initiative: The Annual PIMS Elementary Grades Math Contest

This year PIMS has become involved with MathCounts $^{BC}$ by co-sponsoring their Provincial Competition, held at UBC on April 10, and presenting prizes to the winners of each of the two divisions (**Slava Kouchnarev** and **Cornwall Lau**). In return, the organizers of that competition, notably **Andrew Adler** and **Cary Chien,** have generously offered their energy and expertise to help launch the *Annual PIMS Elementary Grades Math Contest.* Intended for students in Grades 5 to 7, it is scheduled for June 19. In this first year it will draw its participants mostly from the area of Greater Vancouver. Potential participants can find more information as well as a registration form at *www.pims.math.ca/sections/education/Elmacon.html.*

### PIMS Awards Prizes at Three Math Fairs

**Math Fair at Abbotsford:** **Nelly Simoes** of SFU, the PIMS science fair specialist, evaluated the mathematical content of exhibits at the well-attended fair in Abbotsford (Seven Oaks Mall, March 1-3) and awarded three prizes.

**Math Fair at UBC:** At the UBC fair on April 8 Nelly was again on the team of judges, which also included the PIMS associates **Malgorzata Dubiel, Kathy Heinrich, Peter Borwein,** and **Klaus Hoechsmann.** PIMS awarded six prizes and was glad to learn that one of the two exhibits it had ranked highest (**Katie McAllister's** work on numerical palindromes) was subsequently chosen to represent BC at the national level.

**Math Fair at Victoria:** An all-math fair called F. A. M. E. took place at the S.J. Willis Auditorium in Victoria on April 21. It was organized by **Wendy Swonnell** of Lambrick Park Secondary and co-sponsored by PIMS. Winners in each of two divisions (junior and senior) were determined by a team of judges which included **David Leeming** of the UVic chapter of PIMS.

### Thanks Malgorzata

PIMS is very fortunate to be able to count on the continued involvement of Malgorzata Dubiel, who heads its education group at SFU. As the current president of the Canadian Mathematics Education Study Group (the CMESG includes some of the most innovative educators in Canada), she will play a lead role at the CMESG meeting at Brock University (St. Catherines, Ontario) in early June. Before then, she will address the annual meeting of the BC Committee on the Undergraduate Program in Mathematics in Kelowna at the end of May, speaking specifically about PIMS and its annual event *Changing the Culture.*

## PIMS Industrial Collaborative Projects for 1999/2000

This new programme brings together academic scientists from BC and Alberta universities with industrial partners who share common interests and complementary expertise to work together on specific industrial projects identified by the industrial partners as being timely and strategic. These teams work to identify a course of action for attacking the problem; this can be anything from the scientists providing a report on the current state of the literature to initiating a new research project for finding a solution to a new problem. Often teams will decide to hire a graduate student or post-doctoral fellow to carry out some of this work. PIMS provides each team with financial and scientific support, industry-liaison services, infrastructure and administrative help as well as linkages with comparable national and international initiatives. PIMS has recently awarded the following 7 new projects.

- **Title:** Interfacial Mixing in Laminar Pipe Flows
  **Project Leader:** B S. Sutherland (Dept. of Mathematical Sciences, University of Alberta)
  **Project Members:** T. B. Moodie, D. Van Vliet, and K. Dohan (University of Alberta)
  **Industrial Partner:** Imperial Oil
- **Title:** An AirCare Repair Wizard
  **Project Leader:** J. Meloche (Dept. of Statistics, University of British Columbia)
  **Project Members:** J. Zidek (UBC), Steve Stewart (ICBC)
  **Industrial Partner:** ICBC
- **Title:** Modelling the Impact of Climate Change on Vegetation
  **Project Leader:** M. Tsao (Dept. of Mathematics and Statistics, University of Victoria)
  **Project Members:** F. He, M. Lesperance, W. Reed, and J. Zhou (University of Victoria)
  **Industrial Partner:** Pacific Forestry Centre
- **Title:** Low Observable Multiple Target Tracking
  **Project Leader:** M. Kouritzin (Dept. of Mathematical Sciences, University of Alberta)
  **Project Members:** D. Blount (Arizona State University) and B. Schmuland (University of Alberta)
  **Industrial Partner:** Lockheed Martin Tactical Defense Systems, Lockheed Martin Canada
- **Title:** Mathematical Modelling for Real Time Industrial Process Control and Quality Assurance
  **Project Leader:** D. J. Kenway, VisionSmart, Edmonton
  **Project Members:** D. Lyder (VisionSmart), W. A. Armstrong, B. Sutherland, S. Shen (University of Alberta)
  **Industrial Partner:** VisionSmart
- **Title:** Netback Formula Development, Questionaire Development and Analysis
  **Project Leader:** Rita Aggarwala (Dept. of Mathematics and Statistics, University of Calgary)
  **Project Members:** Peter Ehlers, Ernest Enns (University of Calgary)
  **Industrial Partner:** Progas, APPEGA
- **Title:** Business Knowledge Modelling and Contextual Perspective
  **Project Leader:** C. Laflamme (Dept. of Mathematics and Statistics, University of Calgary)
  **Project Member:** M. Mohammed (PanCanadian Petroleum Ltd.)
  **Industrial Partner:** PanCanadian Petroleum Ltd.

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*This newsletter is available on the world wide web at www.pims.math.ca/publications.*