

# The Pacific Institute for the Mathematical Sciences

*Nassif Ghoussoub*

The Pacific Institute for the Mathematical Sciences (PIms), founded by five universities in western Canada, began its operations late last year. PIms is committed to enhancing the mathematical sciences through support for basic research and its applications and to forging meaningful connections between mathematical scientists, the larger scientific community, and the general public. As a result, we expect to see a heightened awareness of the importance of the mathematical sciences in all areas of Canadian society, especially among users of the mathematical sciences in business and industry, educators, governmental agencies, and lay people.

The founding institutions, from the Canadian provinces of Alberta and British Columbia, are the Universities of Alberta, British Columbia, Calgary, Victoria, and Simon Fraser University. Local sources within the five universities are providing initial funding while additional funds are pending from the National Sciences and Engineering Research Council of Canada and sources within the two provincial governments. While a search for director proceeds, Nassif Ghoussoub is serving as interim director, working with an International Scientific Review Panel composed of David Boyd, Richard Ewing, Ronald Graham, Wolfgang Hofer, John Kalbfleisch, Richard Karp, Alistair Lachlan, Bernard

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*Nassif Ghoussoub is professor of mathematics at the University of British Columbia, Vancouver, BC, Canada. His e-mail address is [nassif@math.ubc.ca](mailto:nassif@math.ubc.ca).*

Matkowsky, Robert Moody, Nicholas Pippenger, Gordon Slade, and Gang Tian.

## **The Westernmost Node of the National Network for Collaboration in the Mathematical Sciences**

The Pacific Institute is an integral part of the National Network for Collaboration in the Mathematical Sciences (NNCMS), the result of an unprecedented effort to bring together all components of the mathematical sciences community in Canada. Reflecting a new vision for the Canadian mathematical sciences, the National Network aims to restructure the way in which mathematical scientists relate to both the scientific community and society at large. Simply put, the National Network will provide an overarching national organization to coordinate and prioritize the efforts of mathematical scientists and to encourage the use of the mathematical sciences in other sectors. This means stimulating research in the mathematical sciences through the three Canadian research centers (The Fields Institute, le Centre de Recherches Mathematiques, and the Pacific Institute), investing in the mathematical sciences infrastructure and the training of personnel, and using new communication technologies to bring together scientific expertise in the face of geographic distance.

Within the National Network, several features give the Pacific Institute a role complementary to the two older Canadian mathematics insti-

tutes. First, PImS is organized as a “distributed” institute. This means that there will be no permanent physical home for PImS; instead, all members of the founding universities will equally contribute to and share in the resources of the Institute. To some degree, this will be achieved through the use of new communications technologies. For instance, PImS is running a Distinguished Lectureship on High Performance Computing, sponsored jointly with the Western University Research Consortium (WurcNet), and a colloquium series, both of which are distributed to the five founding universities by videoconferencing technology. Examples of recent talks include Don Ludwig speaking on “Statistics and Public Policy” and Jack Dongarra on “Recent Work in Parallel Algorithms for Linear Algebra”. PImS is also working in partnership with the Tele-Learning Research Network to adapt the “Virtual University” technology to enable more effective collaboration across long distances.

Another unique feature is that efforts will concentrate on short, intensive programs rather than the more traditional thematic programs devoted to the study of a single topic, thus providing PImS the flexibility to react to rapidly developing areas and to represent the mathematical sciences in all their diversity.

### **A Mission of Stimulating Research**

The Pacific Institute will provide support for a broad range of research in the mathematical sciences. Indeed, the academic members of PImS come from many departments, including mathematics, statistics, computer science, physics, electrical engineering, and geophysics. The research activities of the Institute are loosely grouped into six folders—Innovations in the Mathematical Sciences, the Physical and Life Sciences, Computing, the Social Sciences, the Resource Sector, and Technology—which reflect the diversity of mathematical investigation encouraged by PImS. Also illustrating this commitment are the programs of the Institute’s opening meetings held in Calgary and Victoria: Kathy Heinrich, the president of the Canadian Mathematical Society, on “PImS and Mathematics Communication”, Richard Karp on “Combinatorial Optimization as a Tool for Molecular Biology”, Donald Saari on “The Chaotic Complexity of Economics and the Social Sciences”, David Brillinger on “Studying the Tracks of Elephant Seals”, Kamal K. Botros on “The Role of Mathematics in Gas Transmission and Chemical Manufacturing Industries”, and William R. Pulleyblank on “Mathematics, Computing and Industry”.

### **Close Ties to Pacific Rim Countries**

Taking advantage of its geographic location, PImS will bring together mathematical scientists throughout the Pacific Rim. To mention a few examples, PImS is jointly sponsoring and planning the Pacific Rim Conference on Mathematics to be held in Hong Kong in December 1997. PImS will also host the Pacific Rim Geometric Analysis Conference, this being the first time the conference will be held in North America. The 4x3 Canada-China initiative, in which PImS plays a major role, provides a structure for closer working relationships between Canadian academics at the universities of British Columbia, Montreal, Toronto, and McGill University and their Chinese counterparts at Beijing University, Nankai University, and TsingHua University. Within North America, PImS is now a sponsor of the Pacific Northwest Workshop on Mathematical Biology, bringing together American and Canadian mathematical biologists.

### **Training Highly Qualified Mathematical Scientists**

The Pacific Institute aims to nurture young mathematical talent through a variety of programs. Postdoctoral Fellowships for outstanding young researchers have been created, some with matching funds from partners in business, industry, and government. Current proposals call for fellowships in probability theory, biodiversity, forestry, fish-stock management, mathematical chemistry, and imaging. To attract and train the best students, PImS is establishing Graduate Student Fellowships, Graduate Summer Schools, and a Graduate Student Internship Program designed to place students in a research-oriented industrial setting for a portion of their studies.

### **Closer Relationships with Business and Industrial Partners**

PImS has designed and is implementing a number of industrial programs to facilitate university-industrial interaction. One of these is a modified version of the “Oxford Study Group”, providing the means for an academic to visit industry and organize subsequent workshops for both industrial and academic participants. In the same vein, PImS will have an industrial coordinator to develop an Industrial Resource Base to help match university researchers with industrial colleagues and create several Industrial Certification Programs.

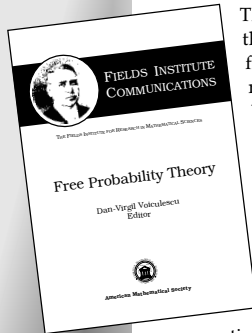
An important part of this strategy depends on developing industrial partners. Expressions of support have been received from and partnerships are developing with MacDonald-Dettwiler Associates, Hughes Aircraft, Powertech Corporation, IBM-Canada, and MacMillan Bloedel. These efforts are being coordinated with various

## American Mathematical Society

### Free Probability Theory

Dan-Virgil Voiculescu,  
University of California, Berkeley

Free probability theory is a highly noncommutative probability theory, with independence based on free products instead of tensor products. The theory models random matrices in the large  $N$  limit and operator algebra free products. It has led to a surge of new results on the von Neumann algebras of free groups.

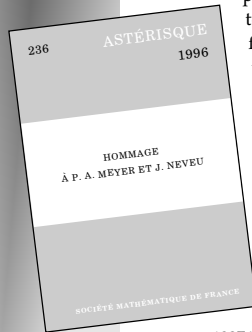


This is a volume of papers from a workshop on Random Matrices and Operator Algebra Free Products, held at The Fields Institute for Research in the Mathematical Sciences in March 1995. Over the last few years, there has been much progress on the operator algebra and noncommutative probability sides of the subject. New links with the physics of masterfields and the combinatorics of noncrossing partitions have emerged. Moreover there is a growing free entropy theory. The idea of this workshop was to bring together people working in all these directions and from an even broader free products area where future developments might lead.

**Fields Institute Communications**, Volume 12; 1997; 312 pages; Hardcover; ISBN 0-8218-0675-0; List \$79; Individual member \$47; order code FIC/12NA

### Hommage à P. A. Meyer et J. Neveu

This tribute to Paul André Meyer and Jacques Neveu displays their wide influence on modern probability theory by gathering nineteen original research papers, drawn from a large range of topics: potential theory, classical stochastic processes and their laws, non-commutative probability, estimates of heat kernels, entropy, ergodic theory, phase transition, stochastic models in financial markets, and excursion theory.



Titles in this series are published by the Société Mathématique de France and distributed by the AMS in the United States, Canada, and Mexico. Orders from other countries should be sent to the SMF, Maison de la SMF, B.P. 67,

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**Astérisque**, Number 236; 1996; 308 pages; Softcover; List \$68; Individual member \$61; order code AST/236NA

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governmental liaison agencies such as the Alberta Research Council, the British Columbia Advanced Systems Institute, and the British Columbia Science Council.

### Mathematics Education and Communication

PImS is developing several initiatives to coordinate meaningful connections with educators and deepen public awareness of the mathematical sciences. As an example, PImS is establishing a summer institute to bring together elementary school teachers with university educators to increase communication between the two groups. Other projects, such as the successful *Math in the Malls* and various high school outreach programs, will take current mathematical science to the general public. In cooperation with E-GEMS (Electronic Games for Education in Math and Science), PImS is developing an innovative partnership with Shaw Cable to provide the means for high school students to create commercial video productions featuring mathematical concepts to be shown on local cable television. This project is designed to be particularly appealing to young women and involve them in the expression of mathematical ideas. In many of these programs, PImS will be working in cooperation with the provincial ministries of education.

### A PImS Integrated Network

Finally, the PImS Integrated Network is developing as a regional node of the National Computer Network for Mathematical Research, a significant investment in the physical infrastructure of the mathematical sciences. By providing fast, high-bandwidth connections between the five founding universities, the Integrated Network will facilitate more effective communication between physically separated researchers. Furthermore, with its access to high-performance computing through its partnership with WurcNet, PImS is helping to advance the mathematical content of high-performance computing.

For more information about the Pacific Institute, its programs or its aims, please consult the PImS Web page at <http://www.pims.math.ca/> or write to [pims@pims.math.ca](mailto:pims@pims.math.ca).