

CMS

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**A Mathematician in
Queen Elizabeth's Court**
Peter Rosenthal, University of
Toronto



*Peter Rosenthal mixing his two
careers - wearing his law robes
outside Osgoode Hall and with
Springer-Verlag Mathematics Editor
Ina Lindemann*

I'm a mathematician and I'm also a lawyer. I became a mathematician at the normal (young) age, inspired by the unique beauty of mathematical reasoning. I became a lawyer in middle age, inspired by the (perhaps fanciful) notion that I could use law to contribute to left-wing political goals such as lessening social and economic inequality. Now, approaching my dotage, I simultaneously practice both professions.

I'm often asked about the relationship between mathematics and law. For example, when I was a law student, the Dean of Law and a visiting professor

approached me in the hallway. The Dean introduced me to the visitor by saying "You might like to meet Peter Rosenthal – he's a professor of mathematics as well as a student in the Faculty of Law."

"That's very interesting," the visiting professor said. "What do you think about the relationship between mathematics and law?"

"I don't really see much of a relationship," I replied.

"Well," he said, "Kant wrote that the only two true sciences are mathematics and law."

"He was right about mathematics," I answered.

(Incidentally, several Kant scholars I asked said that they were not aware of such a quote; if you know a reference, I'd appreciate your sending it to me.)

The more I learn of law, the more convinced I am that my answer was correct. At their best, legal judgments have roughly the structure of a logical argument, but, even in the most coherent decisions, the underlying hypotheses are not stated and huge gaps in reasoning are commonplace. At their worst, judicial pronouncements are completely irrational.

From time to time, the fact that I am a mathematician is referred to in court, often in a semi-joking manner. For example, an opposing lawyer may be hesitating over some simple numerical computation, like "The Plaintiff

(see ROSENTHAL–page 14)

CMS NOTES
NOTES DE LA SMC

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EDITORIAL



Peter Fillmore

The appearance of this issue marks the completion of three years' service of the present Editors-in-Chief of the *Notes*. We started with some ideas for improving the content and appearance, and, with the dedicated assistance of Caroline Baskerville in the Ottawa office and the contributing editors, have tried to put them into effect.

Where to now? Beyond the general mission to provide information for our members and to serve as a means of communication among them, no statement of how the *Notes* can best serve members' needs seems to exist. With the vast amount of information available at one's fingertips on the internet, the answer to this question is by no means clear. And you, our readers, have not been at all helpful: we are receiving letters at the rate of about one per year!

Whether to do new things, or to do what we are doing better, we need your help. Since we have no reporters, we get material where we can and very frequently miss important stories. Please write something for us, or send us material from other publications (such as your university's newspaper) to share with our colleagues. Please write to

us, critically or otherwise, about how we're doing and where we should be going.

La parution de ce numéro marque la fin de notre troisième année en tant que rédacteurs en chef des *Notes*. Grâce à la précieuse collaboration de Caroline Baskerville, du bureau d'Ottawa, et de nos rédacteurs associés, nous sommes parvenus à mettre en oeuvre les idées que nous avons concoctées pour améliorer le contenu et la présentation du bulletin.

À quoi devons-nous nous consacrer maintenant? Les *Notes* ont bien un mandat général, celui de renseigner nos membres et de favoriser la communication entre eux. Toutefois, nous ne savons pas précisément dans quelle mesure elles répondent véritablement aux besoins de nos membres. Comme ces derniers ont accès à une montagne d'information sur Internet en quelques clics seulement, la réponse à cette question est loin d'être claire. À raison d'une seule par année, ce ne sont certes pas les lettres de nos lecteurs qui nous sont d'un grand secours!

Que nous options pour du nouveau ou décidions de poursuivre dans la même voie en nous améliorant, nous avons besoin de votre aide. Comme nous n'avons pas de journalistes, nous puisons nos articles là où nous le pouvons, mais il nous arrive fréquemment de passer à côté de dossiers ou d'événements importants. Nous sollicitons donc votre aide : écrivez-nous ou envoyez-nous des extraits d'autres publications (le journal de votre université par exemple) pour les partager avec vos collègues. Faites-nous part de votre opinion, de vos commentaires ou de vos critiques. Nous avons besoin de savoir où nous nous situons et quelle orientation nous devrions prendre.

RESEARCH NOTES

Noriko Yui and James D. Lewis, Column Editors

Activities at Mathematical Sciences Research Institute (MSRI) Berkeley

MSRI is hosting three programs during the academic year 2000-2001. The year-long program is *Operator Algebras*, and there are two half-year programs, *Algorithmic Number Theory* (Fall 2000), and *Spectral Invariants* (Spring 2001).

The column editor, Noriko Yui, is taking part in the program *Algorithmic Number Theory* as one of the organizers. George A. Elliott is a Research Professor of the program *Operator Algebras*, serving also as an organizer of the NATO Advanced Research Workshop, *Simple C^* -Algebras and Non-Commutative Dynamical Systems* (September 25–29).

We arrived in Berkeley early August. Coming from hot and humid Toronto, we found San Francisco Bay Area unrealistically cold for August. But we are reminded that the month of August in San Francisco is cold as Mark Twain once wrote in his famous poem.

The MSRI is located on the top of a hill overlooking the entire Bay Area, that includes San Francisco downtown, two bridges (Bay Bridge, Golden Gate Bridge), and Oakland. Walking up to MSRI from the UC Berkeley campus provides good exercise when time permits.

The two Clay Mathematics Institute Introductory Workshops in *Algorithmic Number Theory* (August 14–23) and in *Operator Algebras* (August 24–September 2) were the kick-off of the year's activities at MSRI. The Clay Mathematics Institute provided generous support for the two workshops. The two workshops were a rousing success. Anyone who missed the workshops can study the lectures via streaming videos (or CDs!) from MSRI. Here

are brief descriptions of the two workshops.

- Clay Mathematics Institute Introductory Workshop in *Algorithmic Number Theory* (August 14–23, 2000). The workshop was organized by David Bailey, Joe Buhler (Chair), Cynthia Dwork, Hendrik Lenstra, Jr., Andrew Odlyzko, William Velez and Noriko Yui. There were about 100 registered participants. The workshop consisted of series of introductory lectures covering the basic areas of algorithmic number theory, aimed at graduate students and mathematicians without extensive experience in the field. The topics covered included Basic Number Theory Algorithms, Primality and Factorization, Computations in Algebraic Number Theory, Elliptic Curves, Cryptography, Lattice Basis Reduction, and Analytic Number Theory Algorithms. The main lectures were given by Hendrik Lenstra, Jr. (Lattices), Bjorn Poonen (Elliptic Curves), Carl Pomerance (Primality and Factorization), Rene Schoof (Number Field Algorithms), Andrew Granville (Smooth Numbers), among others.

- Clay Mathematics Institute Introductory Workshop in *Operator Algebras* (August 24–September 2, 2000). The workshop was organized by Dietmar Bisch (Chair), Edward G. Effros, Vaughan F. R. Jones and Dan-Virgil Voiculescu. There were 93 registered participants. The workshop introduced graduate students and other scientists to the exciting area of Operator Algebras. The mini course lectures were given by Richard V. Kadison (The Theory of Operator Algebras – Survey), Michael Pimsner (Introduction to K -Theory for Operator Algebras) and Antony Wassermann/Valerio Toledano Laredo (Operator Algebras and Conformal Field Theory). Other lectures included Dietmar Bisch/Vaughan Jones (Sub-

factors and Planar Algebras), Marc Rieffel (Non-Commutative Geometry), Thomas Schucker (The Standard Model of Gravitational, Electromagnetic, Weak and Strong Forces: Almost Commutative Version), and Dimitri Shlyakhtenko (Introduction to Free Probability Theory).

In September, there were two conferences hosted by MSRI. Here are brief descriptions.

- A conference, *The Panorama of Mathematics*, in honor of its Founding Director, S. S. Chern, took place from September 14 to 16. The conference represented mathematics in a very broad context. Activities included: a colloquium talk by Shing-Tung Yau on *Geometric Ideas Inspired by Physics*, a public lecture by Leonard Adleman, *DNA Computation*, and a public lecture by Brian Greene, *String Theory and the Fabric of Spacetime*. The conference drew a large audience from industry, the educational arena and several disciplines of science and was very successful in conveying ideas of mathematics to the general public.

- There was a NATO Advanced Research Workshop in *Simple C^* -algebras and Non-commutative Dynamical Systems* (September 25–29, 2000). The workshop was organized by William Averson, Bruce Blackadar, Edward Effros, George Elliott (Chair), David Handelman, Eberhard Kirchberg, Ian Putnam (Chair), Mikael Rordam, Earling Stormer and Masamichi Takesaki. There were 88 registered participants. The workshop covered two closely allied areas in operator algebras. The first significant applications of the ongoing classification of simple amenable C^* -algebras has provided important new invariants for the study of dynamical systems. On the other hand, dynamical systems have

provided a valuable source of new examples of classifiable simple C^* -algebras. As it was anticipated, there was considerable interaction between the two groups at the workshop.

Forthcoming conferences and workshops at MSRI can be found at their website (<http://www.msri.org>).

Mathematical Challenges of the 21st Century

On August 7-12, 2000, the AMS held the meeting Mathematical Challenges of the 21st Century, the Society's major event in celebration of World Mathematical Year 2000. The meeting took place on the campus of the University of California, Los Angeles, and drew nearly 1,000 participants, who enjoyed the balmy coastal weather as well as the panorama of contemporary mathematics provided in lectures by thirty internationally renowned mathematicians.

The Mathematical Challenges speakers were encouraged to discuss the broad themes and major outstanding problems in their areas rather than their own research. Many of them made serious efforts to communicate to a wide mathematical audience rather than to specialists. Taken together, the lectures provided a captivating portrait of a field with a seemingly inexhaustible appetite for intellectual challenges.

On Sunday, August 6, a lecture by master expositor Ronald L. Graham of the university of California, San Deigo opened the meeting. Graham discussed a number of unsolved problems that, like those presented by Hilbert in 1900, have the intriguing combination of be-

ing simple to state, while at the same time being difficult to solve.

The meeting began in earnest the next day, Monday, August 7, with a lecture by Charles Fefferman of Princeton University, who discussed the Navier-Stokes and Euler equations of fluid mechanics. Fefferman's Princeton colleague, Sergiu Klainerman, also presented a lecture about nonlinear partial differential equations (PDEs), but from a completely different viewpoint. Rather than focusing on specific equations, Klainerman presented an overview of a wide swath of the field of PDEs.

Geometry and geometrical ideas arose in many of the talks. William P. Thurston of the University of California, Davis, discussed his "geometrization conjecture." Using two laptop computers, he dazzled the audience with an array of computer software tools designed to help mathematicians develop new intuition about 3-manifolds. Clifford Taubes of Harvard University talked about the very different world of 4-manifolds.

Another theme was the use of mathematics in science and technology. David Donoho of Stanford University discussed the field of data analysis, which is becoming increasingly important as humankind amasses ever more, and ever more complicated, data. The keen need for ideas from mathematics was also illustrated in the lecture by David Mumford of Brown University, who talked about the use of statistical methods in modeling visual perception, and in the lecture by Richard Karp of the International Computer Science Institute, who spoke on the use of math-

ematics in molecular biology, particularly genomics.

Quantum computing was the subject of two lectures at the meeting. Peter Shor of ATT Laboratories talked about his ground-breaking work on a quantum algorithm for factoring and on quantum error-correcting codes. Providing a different take on quantum computing, Michael Freedman of Microsoft Research described his ideas for exploiting topology, in particular braid groups and the Jones polynomial, to model quantum computation.

Many at the meeting appreciated the lecture by James Arthur of the University of Toronto, who gave an especially accessible and clear overview of the Langlands program. Touching on some of the same themes was the lecture by Peter Sarnak of Princeton University, in which he spoke of "the unreasonable effectiveness of modular forms in mathematics" and the mysteries of the Riemann Hypothesis.

Another highlight was the lecture by Edward Witten of the Institute for Advanced Study, who discussed the importance of quantum field theory in physics and mathematics. The last lecture of the meeting, presented by Alain Connes of the College de France and the Institut des Hautes Etudes Scientifiques, provided a marvelous ending. Connes presented a lucid description of noncommutative geometry, from its roots through its current directions.

This report was edited from the original, written by Allyn Jackson (a Senior Writer and Deputy Editor for the Notices of the AMS) which can be found at http://www.ams.org/amsmtgs/mathchall_fini.html

CMS MEMBERSHIP ...

The 2001 Membership Notices have been mailed. Please renew your membership now.

ADHÉSION À LA SMC ...

Les avis d'adhésion 2001 était postés. S'il vous plaît renouveler votre adhésion maintenant.

AWARDS / PRIX

Four Canadians Honoured for Outstanding Achievements

The winner of the Canadian Mathematical Society's 2000 Coxeter-James Prize for mathematics research is Dr. Damien Roy. Professor Bernard Courteau is the recipient of the 2000 Adrien Pouliot Award for mathematics education. Dr. Stephen J. Astels has won the Society's 2000 Doctoral Prize and Dr. Arthur Sherk will receive the CMS Distinguished Service Award for 2000. All four awards will be presented at the CMS 2000 Winter Meeting Banquet on December 11th at the Hotel Vancouver.

Prix Coxeter-James 2000 de la SMC - Professeur Damien Roy (Université d'Ottawa)

Le prix Coxeter-James rend hommage aux jeunes mathématiciens qui se sont distingués par l'excellence de leur contribution à la recherche mathématique.

Né à Verdun (Québec), le professeur Damien Roy est actuellement professeur agrégé à l'Université d'Ottawa. Il a obtenu son B.Sc. de l'Université de Montréal, sa M.Sc. de l'Université McGill et son Ph.D. de l'Université Laval. Il a par la suite mené des études postdoctorales à Paris VI, à Laval et au Centre Interuniversitaire en Calcul Mathématique Algébrique avant d'être engagé à l'Université d'Ottawa. Le professeur Roy a été invité à participer à un programme du Mathematical Sciences Research Institute (MSRI) en 1993 et a reçu le prix du Jeune chercheur de l'année 1998 de l'Université d'Ottawa.

Damien Roy a apporté des contributions de très haut niveau en théorie de la transcendance et en approximation diophantienne. Il a, en collaboration avec Jeffrey Thunder de la Northern Illinois University, établi un raffinement d'importance fondamentale du lemme de Siegel pour un système d'équations linéaires homogènes, et en 1992 a résolu complètement un problème posé en 1980 par J.J. Sansuc (Paris VII). Récemment, Damien Roy a établi un nouveau théorème d'interpolation pour des fonctions de deux variables complexes qui lui a permis de reformuler la conjecture de Schanuel en termes d'un critère algébrique faisant intervenir des polynômes à deux variables à coefficients entiers. En collaboration avec M. Laurent (Institut de Mathématique de Luminy, CNRS) et Michel Waldschmidt (Université de Paris VI), il a également introduit de nouvelles techniques dans l'étude de l'indépendance algébrique des nombres.

Prix Adrien-Pouliot 2000 de la SMC - Professeur Bernard Courteau (Université de Sherbrooke)

Le prix Adrien-Pouliot rend hommage aux personnes ou aux groupes qui ont fait une contribution importante et soutenue à l'enseignement des mathématiques au Canada.

Professeur émérite à l'Université de Sherbrooke (Québec), Bernard Courteau est l'une des figures dominantes

de la profession au Québec de par son aptitude à susciter l'intérêt des enseignants, des élèves et du grand public pour les mathématiques. En 1991-1992, il a créé le module mathématique de l'exposition itinérante «ÉbulliScience», qui a attiré plus de 400 000 visiteurs. Pour sa contribution à la vulgarisation mathématique, il a en outre été élu président d'honneur de la Quinzaine des sciences de l'Estrie.

Le professeur Courteau consacre une grande part de son temps à rallier à une cause commune les enseignants de mathématiques de tous les niveaux. Il a joué et joue encore un rôle actif dans les organismes québécois voués à l'enseignement des mathématiques, notamment en tant que membre du Conseil de l'Association canadienne-française pour l'avancement des sciences (ACFAS) (1996-1998) et du Comité exécutif du Conseil pédagogique interdisciplinaire du Québec (CPIQ) (1995-1997). Il a de plus été président de l'Association mathématique du Québec (AMQ) de 1993 à 2000. Sa prodigieuse énergie, son attitude progressiste et sa passion des mathématiques lui ont valu maints éloges.

2000 CMS Doctoral Prize - Dr. Stephen Astels (University of Waterloo)

The CMS Doctoral Prize recognizes outstanding performance by a doctoral student who graduated from a Canadian university.

Born and raised in Truro, Nova Scotia, Dr. Astels did his undergraduate studies at Acadia University, Nova Scotia, and won the Governor General's award. He obtained both his masters and doctoral degrees from the University of Waterloo under the supervision of Dr. Cameron Stewart. He is currently an NSERC postdoctoral fellow at the University of Georgia with Andrew Granville, a leading number theorist who graduated from Queen's University. Dr. Astels served as the President of the Graduate Students Association at the University of Waterloo and was a member of the University Senate and Board of Governors.

In his thesis, Dr. Astel studied the properties of Cantor sets and their application to problems of Diophantine approximation. He generalized a theorem of Newhouse (1970) to the sum of any number of Cantor sets and established a lower bound for the thickness of the sum of two Cantor sets in terms of the thickness of each set and proved that, in general, the lower bound is best possible. Mathematicians have sought such a result for at least 30 years.

2000 CMS Distinguished Service Award - Dr. Arthur Sherk (University of Toronto)

The CMS Distinguished Service Award is to recognize individuals who have made sustained and significant contributions to the Canadian mathematical community.

Dr. Arthur Sherk received his undergraduate education at McMaster University, Ontario. He obtained his masters from

McMaster in 1955 and his doctorate from the University of Toronto in 1957, under the supervision of Dr. Donald Coxeter. He remained at the University of Toronto until his retirement in 1994. His research interests are finite and discrete geometry, a field in which he has published 20 papers and two texts. He has also been co-editor of two collections of papers and of "Kaleidoscopes, Selected Writings of H.S.M.Coxeter".

Dr. Sherk has been a member of the Canadian Mathematical Society since 1955. Over the past forty five years, he has served the Society in a number of capacities. He was Managing Editor of the Canadian Mathematical Bulletin from 1963 to 1967 and of the Canadian Journal of Mathematics from 1978 to 1983. He has been the Society's Treasurer since 1993 and is now in his third term.

AMERICAN MATHEMATICAL SOCIETY

Conference Proceedings, Canadian Mathematical Society

This series is published for the Canadian Mathematical Society by the AMS. It consists of the proceedings of internationally attended conferences on pure and applied mathematics sponsored by the CMS. CMS members may order at the AMS member prices. (ISSN 0731-1036) Softcover.

Stochastic Processes, Physics and Geometry: New Interplays. I
A Volume in Honor of Sergio Albeverio

Stochastic Processes, Physics and Geometry: New Interplays. II
A Volume in Honor of Sergio Albeverio

Stochastic Processes, Physics and Geometry: New Interplays. II
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Constructive, Experimental, and Nonlinear Analysis

Stochastic Models

Geometric Control and Non-holonomic Mechanics

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Stochastic Processes, Physics and Geometry: New Interplays. I
A Volume in Honor of Sergio Albeverio

Fritz Gesztesy, University of Missouri, Columbia, Helge Holden, Norwegian University of Science and Technology, Trondheim, Jürgen Jost, Max Planck Institut für Mathematik, Leipzig, Germany, Sylvie Paycha, Université Blaise Pascal, Aubiere, France, Michael Röckner, Universität Bielefeld, Germany, and Sergio Scarlatti, Università G. D'Annunzio, Pescara, Italy, Editors

These volumes present state-of-the-art research currently unfolding at the interface between mathematics and physics. Included are select articles from the international conference held in Leipzig (Germany) in honor of Sergio Albeverio's sixtieth birthday. The theme of the conference, "Infinite Dimensional (Stochastic) Analysis and Quantum Physics", was chosen to reflect Albeverio's wide-ranging scientific interests. The articles in these books reflect that broad range of interests and provide a detailed overview highlighting the deep interplay between stochastic processes, mathematical physics, and geometry. The contributions are written by internationally recognized experts in the fields of stochastic analysis, linear and nonlinear (deterministic and stochastic) PDEs, infinite dimensional analysis, functional analysis, commutative and noncommutative probability theory, integrable systems, quantum and statistical mechanics, geometric quantization, and neural networks. Also included are applications in biology and other areas.

Most of the contributions are high-level research papers. However, there are also some overviews on topics of general interest. The articles selected for publication in these volumes were specifically chosen to introduce readers to advanced topics, to emphasize interdisciplinary connections, and to stress future research directions. Volume I contains contributions from invited speakers; Volume II contains additional contributed papers.

Volume 28: 2000; 333 pages; Softcover; ISBN 0-8218-1939-3; List \$75; Individual member \$45; Order code CMSAMS/28CMS00
Volume 29: 2000; approximately 664 pages; Softcover; ISBN 0-8218-1960-7; List \$125; Individual member \$75; Order code CMSAMS/29CMS00

NEW! Constructive, Experimental, and Nonlinear Analysis
Michel Théra, University of Limoges, France, Editor

This volume presents twenty original refereed papers on different aspects of modern analysis, including analytic and computational

number theory, symbolic and numerical computation, theoretical and computational optimization, and recent development in nonsmooth and functional analysis with applications to control theory. These papers originated largely from a conference held in conjunction with a 1999 Doctorate Honoris Causa awarded to Jonathan Borwein at Limoges. As such they reflect the areas in which Dr. Borwein has worked. In addition to providing a snapshot of research in the field of modern analysis, the papers suggest some of the directions this research is following at the beginning of the millennium.

Volume 27: 2000; approximately 302 pages; Softcover; ISBN 0-8218-2167-9; List \$70; Individual member \$42; Order code CMSAMS/27CMS00

Stochastic Models
Luis G. Gorostiza, Centro de Investigación y de Estudios Avanzados, Mexico City, Mexico, and B. Gail Ivanoff, University of Ottawa, ON, Canada, Editors

This book presents the refereed proceedings of the International Conference on Stochastic Models held in Ottawa (ON, Canada) in honor of Professor Donald A. Dawson. Contributions to the volume were written by students and colleagues of Professor Dawson, many of whom are eminent researchers in their own right.

A main theme of the book is the development and study of the Dawson-Watanabe "superprocess", a fundamental building block in modelling interaction particle systems undergoing reproduction and movement. The volume also contains an excellent review article by Professor Dawson and a complete list of his work.

This comprehensive work offers a wide assortment of articles on Markov processes, branching processes, mathematical finance, filtering, queueing networks, time series, and statistics.

Volume 26: 2000; 430 pages; Softcover; ISBN 0-8218-1063-4; List \$99; Individual member \$59; Order code CMSAMS/26CMS00

Geometric Control and Non-holonomic Mechanics
V. Jurdjevic and R. W. Sharpe, University of Toronto, ON, Canada, Editors

Control theory, a synthesis of geometric theory of differential equations enriched with variational principles and the associated symplectic geometry, emerges as a new mathematical subject of interest to engineers, mathematicians, and physicists. This collection focuses on several distinctive research directions having origins in mechanics and differential geometry, but driven by modern control theory.

This book provides quick access to new research directions and also demonstrates the effectiveness of new insights and methods that control theory brings to mechanics and geometry.

Volume 25: 1998; 239 pages; Softcover; ISBN 0-8218-0795-1; List \$49; Individual member \$29; Order code CMSAMS/25CMS00

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AMS

AMERICAN MATHEMATICAL SOCIETY

EDUCATION NOTES

Ed Barbeau, Column Editor

Orzech wins 3M Award

Our congratulations go to Professor Morris Orzech, of Queen's University, who has been selected as one of ten 3M Teaching Fellows, an honour awarded each year by 3M Canada and the Society for Teaching and Learning in Higher Education. His citation identified him as a leader in curriculum development who was one of the first at Queen's to use "incomplete notes" and a computer-based bulletin board called "Math Chat". He is past chairman of the Education Committee.

Mathematical Skills Inventory

In 1989, in response to concerns about high failure rates in entry-level mathematics and science courses at Memorial University, a task force commissioned by the government in response put the main blame on low expectations in high school mathematics and the propensity of too many students to avoid the more intensive courses, as well as on a deterioration of teaching conditions in first-year mathematics at the university. In 1996, an ad hoc committee of the Memorial University Senate studied the situation. Extensive interviewing of students and faculty revealed that many students felt that the university held unreasonably high expectation about what they should know, while faculty decried insufficient knowledge of prerequisite mathematics to enable students to succeed.

Responding to one recommendation of the Senate report, in 1998, the mathematics department implemented mandatory placement of students using the *Mathematical Skills Inventory* (MSI). These examples illustrate how basic were the questions:

(A) Write in lowest terms: $\frac{28}{52}$

(B) 20% of 75 = ?

(C) If $p = \frac{q-r}{s}$, then $r = ?$

Indeed, a review by curriculum experts of the department of education revealed that half the items on the MSI were covered by the Newfoundland school curriculum by grade 9 and 80 percent by Grade 10. All students taking a precalculus course or a course required for prospective teachers of primary and elementary education must take the MSI; students taking calculus are exempt.

The implementation of a placement test recognizes that you cannot teach mathematics to anyone except on a level that the person can accept. A mismatch result is failure for the student, as past failure rates can attest. Since university students must be able to follow and make sense of the kinds

of computations occurring in a typical university lecture, MSI tests the skills that students should have at their fingertips, and so no calculators are permitted.

How do the students perform? About 90% of the students from *advanced secondary mathematics* achieve at least 50%, with a mean for the group of about 67%. About 60% from *academic secondary mathematics* achieve at least 50%, with a mean of about 52%. Since there are about 1000 students coming to Memorial each year with a background in *academic mathematics*, it is not hard to account for the conflicting views of students and faculty about expectations. The more than 400 students who cannot achieve appropriate placement scores are denied entry to the precalculus and prospective teacher course and must take a noncredit course to upgrade their skills at an additional cost of up to three semesters of work and an extra \$1000 in fees.

Despite the burden on deficient students, one cannot solve the problem by simply dropping mathematics requirements. Other disciplines see such requirements as essential, and one cannot lower the standards of the regular university courses without compromising the credibility of the university degree. Some students may try to avoid a low score on the MSI by enrolling in sessions offered by a commercial tutorial service. While they may increase their scores in this way, it is not likely that their resident skills will have improved significantly and the ultimate result of such mark manipulation would be detrimental to the student. Memorial University has taken a more constructive approach to this situation by establishing a program of study through its Mathematics Learning Centre. This program is individualized for each student and concentrates on teaching those skills that the student lacks. It takes full advantage of the most recent research into how to improve instructional effectiveness; indeed, one of the centre's mandates is conducting research on this very issue.

(The foregoing was condensed from an article written by Herbert S. Gaskill, professor and head of the Department of Mathematics and Statistics at Memorial University, for the public press.)

Joy of X and Connect-Me

In the October issue of these *Notes* (32:6 (2000) 17-18), Lynda Colgan described how Queen's University is attempting to develop capacity for leadership and mentorship among prospective teachers. From her experience with courses in the elementary curriculum, she became aware of how uncertain and unsatisfied many of the candidates were about their experiences and abilities in mathematics. Beginning in November,

1998, a community of 60 of these elementary teachers participated in a voluntary enriched program with the provocative title, *The Joy of X*. It was based on two assumptions: (1) rich, carefully-chosen, professional development experiences could strongly affect the mathematical knowledge and disposition of cadet teachers; (2) by making available detailed exemplars of classroom scenarios, the pedagogic repertoires of these teachers should be significantly increased.

The participants attended a series of twelve workshops, generally 90 minutes long, where they worked collaboratively, posing problems, formulating conjectures, and discussing the validity of various solutions, supported by facilitators who helped frame context, facilitated discussion of mathematical ideas and drew out conceptual connections. Each session had three components: (i) hearing from an experienced teacher about “transforming experiences”; (ii) participating in hands-on activities; (iii) discussing pertinent curricular and instructional issues. To begin the group was warmed up with a pleasurable “opener” that was drawn from any of the strands and promoted problem solving and reasoning.

Each session had a formal focus, such as one conducted by Bill Higginson on *Using origami boxes to explore algebra and algebraic thinking*. Students were led to an analysis of steps required to make various sorts of boxes, and then used the boxes as models for problems in different areas. Lynda Colgan conducted a session on when three rods drawn from a bag might form sides of a triangle. Rena Upi-tis, dean of the faculty, looked at the mathematics of art and music. Guest appearances were made by David Poole of Trent University (graph theory) and Susan Stuart, professor of elementary mathematics education curriculum at Nipissing University (multicultural mathematics). In the end, more than 80% of the candidates agreed that the program achieved its goals of providing students with an opportunity to build a positive emotional experience with mathematics and to help them broaden their often very limited perception of the discipline.

Although the students in this first group have graduated and dispersed as far away as England, Mexico and Arctic Canada, they are still joined on the web by *Connect-ME*, a forum for discussion and mentorship created by the Mathematics, Science and Technology Education Group at Queen’s University inspired by the Swarthmore College *Math Forum*. Principal areas of discussion are led by moderators, who became part of the community through *Joy of X* workshops, and many of the teachers themselves were generous in sharing lesson plans and activities.

There are six facets to *Connect-ME*: (1) *Xcite* (links to exemplary resources on the internet, lesson plans created by *Connect-ME* teachers and print resources); (2) *Xchange* (forum for discussing mathematics education issues with experts from Canadian school and universities); (3) *XOS Line* (an archived help/advice line with a library of frequently asked questions); (4) *Xtra* (news, updates, information about professional development); (5) *Xplore* (a collection of open problems that *Connect-ME* teachers pose, post and work on); (6) *The Joy of X* (a collection of photographs, papers and rich resource materials from the workshop series).

Since the launch, the Queen’s group have tried to keep the site active by sending out weekly e-mail updates to all subscribers; these include professional development information, news of opportunities, and reports on new additions to the website. The *Xcite* page is most frequently visited by community members; many have accessed the Ontario curriculum mathematics expectations, downloaded and adapted some of the exemplary lesson plans to their own needs. Electronic tracking shows that teachers are using links to assessment, lesson plans and manipulatives in that order. It seems that *Xtra* is taking over from *Xchange* as the place for communication among subscribers. Between August and November of 1999, for example, twenty-one sets of resources were added. The workshop notes from a one-day conference that featured provincial mathematics leaders with Nicholas Jackiw, author of *The Geometer’s SketchPad*, were made available through the website. The problems on *Xplore* are organized into Primary and Junior divisions, and contributions from subscribers allow for various approaches and provide the opportunity for them to clarify their own thinking.

(The foregoing was condensed from an article by Lynda Colgan. Here are the websites: *Connect-ME* can be found at <http://hydra.educ.queensu.ca/CM/> while *Math Forum* hangs out at

<http://forum.swarthmore.edu/>.)

Teacher Preparation Discussion

The October, 2000 edition of *Mathematics Education Dialogues* from the National Council of Teachers of Mathematics is on the topic *Teacher preparation: a never-ending quandry*. Those following the education session at the CMS Winter 2000 Vancouver meeting might be interested in making a visit to the website nctm.org/dialogues. There are several opinions expressed including those from Alan Tucker at SUNY, Cathy Kessel and Liping Ma in California, and Diane Resek at San Francisco State University.

More Steps

A rambling account of the 2000 IMO in South Korea
by Team Leader Andy Liu, University of Alberta

When asked to describe the campus of Simon Fraser University, where the Canadian national team for the International Mathematical Olympiad held its summer camp, deputy leader Christopher Small's young daughter Helen said, "More steps." This was in reference to the daily mounting of sets after sets of stairs. By a thoughtful arrangement, our dormitory was at the opposite end of the campus to the classrooms, and the town house, where Christopher, Helen, her mother Kristin and I stayed — Viktoria Mineva, the official observer who accompanied the team, stayed with the students — was even more steps away. Thus, we all had good exercise without having to go out of our way.

This was my first direct involvement with a Canadian team, and as I had only met the current team members for a brief three-day period during the winter camp at Trent University — a most successful event due largely to the tireless effort of David Poole, and the presence of Byung-Kyu Chun, Richard Hoshino, Daryl Tingley and Bill Sands — we were still feeling one another out. Fortunately, Christopher was an old hand, and the presence of five additional students from the greater Vancouver area during the first few days made this process less awkward. Of course, we could count on Helen to break the ice whenever necessary.

Of the six team members, David Arthur and David Pritchard had been to Romania the year before, and although Daniel Brox unexpectedly failed to join them, these three were definitely the strongest by far. During the winter camp, they tended to hang out with one another. Denise Cheung, Keon Choi and David Goodman were all novices, and I was worried that the team might split into two. The five local students — not counting Daniel — sat together at one table, while the team members sat together at another. Although I would have liked to see more interaction between the two groups, this seemed to drive the team members closer to one another.

As the camp progressed, my worries began to evaporate. David Arthur was very out-going, and made everyone feel at ease with his infectious smile. David Pritchard, on the other hand, provided quiet leadership. David Goodman had no experience prior to his participation in the winter camp, and was a bit nervous throughout, and I believe this contributed to his subpar performance, well below what his immense talent warranted. As the only female team member, Denise handled herself superbly, and her ringing laugh was most soothing. Daniel, the youngest and the only one still in high school, was very athletic, and he found a companion in Keon who had deceptive strength and agility. Overall, the team chemistry was excellent.

It is my belief that the summer camp is not when the team members learn new concepts or techniques, apart from

picking up an odd trick here and there — such as Schur's Inequality. One needs to spend a lot of time before one can apply such results with confidence. The main aim should be preparing the team members mentally, getting them into battle-readiness without burning them out. We did work on their presentations. Being super-intelligent, they tend to skip over steps which might puzzle lesser mortals. On more than one occasion, Helen was asked to put on their scripts her famous words, "More steps."



The IMO Team (l to r): David Goodman, Daniel Brox, Team Leader Andy Liu, Keon Choi, David Arthur, David Pritchard, Denise Cheung, Deputy Team Leader Christopher Small, Deputy Leader Observer Viktoria Mineva

We had plenty of distraction, from foraging for food to dealing with the media. For those unfamiliar with the Simon Fraser campus, it is situated on top of a hill in Burnaby. I was told that despite repeated petitions from the students, the administration refused to allow a grocery store to open there. The cafeterias were fine as long as they were open, and as long as our meal cards worked. However, as we arrived during the Canada Day long weekend, we had to rely on Deanne Verones to supply us with our daily victuals.

I had had frequent email exchanges with various people during the preparation period for the summer camp, and that was when I first came across Deanne's name. I was under the impression that she was either a staff member of the Canadian Mathematical Society or of Simon Fraser, but it turned out that she was specially hired to look after us. To her and her helpers Esther, Alyssa and Eric, we owe deep gratitude.

The fourth of July was set aside as Media Day. There were reporters from a couple of local newspapers. They interviewed the team members, and took some photos. I was reasonably happy with what came out in print, except that they worked so hard to apply the term "odd" to the team members that the term "odd-numbered team" was used, along with a picture with six students. There was also a film crew from a local television station. Since this was not yet news, they called it a feature. However, they did not have an education team, and the closest they could come up with was their cook-

ing team — definitely food for thought. They kept asking the students what they had to *eat* to become good in mathematics.

Robert Morewood graduated from high school in 1980, just before Canada participated in the International Mathematical Olympiad. He would most likely have been on the national team if there were one then, and proceeded to an undergraduate degree at the University of Alberta in Honours Mathematics, with good results in the Putnam. He came and helped out at the summer camp almost daily, and hosted the lot of us for a barbeque at his home. He showed the team members their fifteen seconds of fame on tape. They were dismayed that all the television showed was their mouths, munching on carrots and other choice soul food.

We had requests for radio interviews as well. Most of them wanted Daniel, the pride of British Columbia. I got into one of them myself, and bit my tongue too late to let slip the reference to Deanne as that wonderful lady who satisfied our daily needs. Fortunately, it was not a live broadcast, and the station had the good taste to let me rephrase it. After that episode, I let Christopher and Daniel do the talking.

Daniel's role would be taken over by Keon once the team landed in South Korea. He was very excited because it was a home-coming for him. In fact, he and other contestants would be housed in KAIST, the Korean Advanced Institute of Science and Technology, where his elder sister is enrolled. His recurrent nightmare was that she would be assigned to be the guide to the Canadian team, but this did not come to pass.

I left the team three days in advance in order to join other team leaders in South Korea to constitute the International Jury for the IMO, whose main task was to choose from the carefully prepared shortlist six problems for the actual competition. Before departure, I consulted Keon about a document from American Express titled "International Traveller's Advisory". It said, "Your dress, general behaviour and appearance may have to conform to local standards. Minor violations can lead to detention even before the trial has begun. Serious violations may lead to jail sentences. Sentences will be served in local prisons."

Later, it continued, "Greeting and saying 'Thank You' are very important to Koreans. Words of greeting and thanks are always said with a bow of the head. The depth of the bow depends on the relative seniority of the two speakers. Minor violations can lead to detention even before the trial has begun. Serious violations may lead to jail sentences. Sentences will be served in local prisons." Keon thought that American Express was paranoid.

* * * * *

After a lonely journey, I arrived at the Seoul airport, and was met by friendly guides. Several other leaders were there at about the same time, and some of them, the Dutch and the Iranians, had come with their entire teams. The students

were bused to a different location before we were deposited at a magnificent building in a town named Chonam.

We were met at the doorsteps by Professor Sung-Je Cho, dressed in traditional Korean garb, but incongruously talking on his cellular phone! The building was brand new. It was said to be a training facility for government officials, though several people ventured the suggestion that it was a military compound. We were certainly well isolated. The furnishing was sparse but functional and comfortable. The food tended to be luke warm but otherwise excellent, with lots of variety, though the Korean specialty, kimchi, was to be partaken of by the stranger with discretion.

Having served on the Problem Selection Committee for the International Mathematical Olympiad on three occasions, I found it most interesting to see how the other half lives, this being my first experience as a team leader. Back in the early eighties, I had attended a few Jury meetings as the deputy leader of the United States, and I recalled them being much more multi-lingual. Things did move at a much slower pace because full translation was made for all discussions, but everyone felt part of it. This time, the meetings were dominated by the native English speakers, and I sensed that a lot of other leaders felt left out.

On the whole, the meetings progressed smoothly, though there were quite a bit of maneuvering beneath the surface as various interest groups promoted their favourite problems. Towards the end, tempers flared up somewhat, resulting in a few short but sharp exchanges. Jozsef Pelikan, the polyglot leader of Hungary, a four-time medalist in his student days, observed, "Every I.M.O. has its silly moment, and I think the one for 2000 has just arrived."

Anyway, six problems were selected from the shortlist prepared by the South Korean committee, reinforced by Svetoslav Sachev of Bulgaria and Marcin Kuczma of Poland, two problem-proposers and problem-solvers of the first rank. My deep regret was that a lovely little problem in combinatorial geometry, proposed by Frederico Ardila of Colombia, was left off. However, I was glad to see the following delightful gem from Jozsef appeared as the first problem on the second day of competition.

A magician has one hundred cards numbered 1 to 100. He puts them into three boxes, a red one, a white one and a blue one, so that each box contains at least one card. A member of the audience selects two of the three boxes, chooses one card from each and announces the sum of the numbers on the chosen cards. Given this sum, the magician identifies the box from which no card has been chosen. How many ways are there to put all the cards into the boxes so that this trick always works? Two ways are considered different if at least one card is put into a different box.

After finalizing the paper, the Jury began to work on the wording of the chosen problems. The English version is con-

sidered the most important since all other linguistic versions were to be based on it as much as was possible. For this task, the host struck an ad hoc committee, consisting of the leaders from the United Kingdom, the United States, Australia, New Zealand, South Africa, Canada and India. We were to take a half-an-hour break, and then reconvene.

At the end of the break, I was unable to locate the committee. I ran into Titu Andrescu, the leader of the team from the United States. He had been around more often than I in recent years. He told me that he usually did not bother since, being an expatriat Romanian, his presence was not always welcome. Not being a native English speaker myself, I had half a mind to follow his example.

However, I felt duty bound to humour our kind host. Eventually, I managed to find where the committee was meeting. When I got there, I learned that they had started without taking a break, but had not bothered to inform me. The room was full, as various observers from some countries were at the table. After making a few minor suggestions and watching them brushed aside in short order, I saw no point in staying further.

Our stay in Chonam was not all work and no play. Our Korean hosts arranged for us many cultural festivities. It suffices to say that drums played a major part in every facet of the performing art. I found myself wondering whether a disco with background music provided by those drums could catch on.

On the first day of the contest, the first part of our work was done, and everyone relaxed a bit. We still had to answer questions from the contestants, but we were not overwhelmed. There were amusing moments as one student asked what the definition of a magician was! I supposed the answer to that problem may depend on whether the magician might have extrasensory powers.

After answering questions on the second day, the leaders moved to a five-star hotel in the city of Taejon where KAIST was located, there being no longer any reason for segregating the students from us. To tell the truth, I very much preferred our accommodation in Chonam. While luxurious, the hotel room was exceeding small, and when Christopher moved in as well, there was really no room even to breathe.

We had a lot to say to each other. I had the benefit of having read the students' scripts on the first day of competition, while Christopher had the advantage of being with the students all the time. It became clear that we had mixed results, some exceeding our expectations while others falling short (more importantly, of their own expectations).

The scripts were graded by the leaders, but we had to defend our grading before a team of two coordinators for each of the six problems. We scrambled as best we could and had ready the problems which were to be coordinated early the next day.

In recent years, it has been the practice for the host to pho-

tocopy the scripts of the students. It was initially intended as a spot check to deter cheating. However, our Korean host made full use of the photocopies. I was convinced they had graded all the papers overnight, no mean feat! When we went in, they had already made up their minds what marks each student should get. They smiled politely, but stood firm. I supposed consistency had to be achieved by being inflexible. They seemed quite willing to forgive trivial typographical errors when a solution was virtually perfect, but were extremely harsh in withholding part marks for minor progress. This made the scores more polarized, certainly so for our team.

To take their minds off the competition, our Korean host organized many activities for the students, such as a visit to the Science Museum. However, many contestants preferred to hang around the residence and socialize with one another. Denise always had to come over to the male dormitory, as the boys were not allowed to enter hers, and her hair was not long enough to dangle out of the window. It was said that David Pritchard managed to breach the compound on more than one occasion, but this was unconfirmed.

On the other hand, cleaning ladies walked in and out of the bathrooms of the male dormitory unceremoniously. Marcin told me that when he was working as a member of the problem committee, he often slept in, but the maid would come into his room and made his bed whether he was in it or not. One day, he decided to sleep in the altogether, with his better side facing the door. After that, they would call to see when he would like to have his bed made. However, it seemed a pity to have to lose the battle before winning the war.



Denise Cheung is crowned Miss IMO

On the last evening, there was an open-air barbeque party with very loud music, but surprisingly no drums. People just mingled, and many danced on stage or just in front. Halfway through the gala event, it was announced that Denise was elected Miss IMO of 2000. This was accomplished without

the support of her team-mates, who all cast their votes for her as Mr. IMO. However, Denise lost out to a German boy on that count.

It was soon discovered that Daniel had disappeared. The consensus was that he had gone near the stage to check out the dancing girls. When he eventually returned, the others had disappeared, leaving only Viktoria and Christopher with me. I made several strong hints to Daniel to offer to dance with Viktoria, but he had cold feet, and went off to look for his team-mates. Nevertheless, Viktoria had a wonderful time, marred only by the singing of a group of Bulgarian students on stage. They did not seem to be able to carry any tune. Later, there was a very moving moment, when students from the various former republics of Yugoslavia joined in a chorus.



David Arthur receives his Gold Medal

This has to be the experience of a life-time for the team members, regardless of the result. As reported elsewhere, David Arthur improved from a bronze medal to a gold medal, with a score that placed him among the top ten contestants. On his first attempt, Daniel got a silver medal, and only two

points shy of a gold medal. David Pritchard added a silver medal to the bronze medal he collected last year.

Before the final Jury meeting when the cut-off marks for medals were decided, it was not clear whether Keon would have a bronze medal or not. When it finally became clear that he had indeed a bronze medal, he was ecstatic. He had arranged to stay in his native country for some extra time, and now he had something to show off.

Denise was two points shy of a bronze medal, but nailed a complete question to earn an honourable mention. David Goodman was understandably disappointed, but the other team members were very supportive. After all, there were no losers, only smaller or bigger winners. The International Mathematical Olympiad was but an interlude in one's mathematical career, and there were other goals to attain. As Helen said, "More steps."

This most successful IMO was made possible with the help of many CMS members and our sponsors: the Ontario Ministry of Education; the Quebec Ministry of Education; Alberta Learning; the Canadian Mathematical Society; Sun Life Financial; the Pacific Institute for the Mathematical Sciences; the Fields Institute for Research in the Mathematical Sciences; the Samuel Beatty Fund; the Department of Mathematics, Simon Fraser University, the Department of Mathematics, University of New Brunswick at Fredericton; the Department of Mathematics and Statistics, University of Calgary; the Department of Mathematics, University of Toronto; the Department of Mathematics and Statistics, University of Ottawa and the Centre for Education in Mathematics and Computing, University of Waterloo. To them all we extend our thanks.

BRIEF BOOK REVIEWS

S. Swaminathan, Dalhousie University

Geometric Control and Non-holonomic Mechanics,

edited by V. Jurdjevic and R. W. Sharpe, CMS Conference Proceedings, American Mathematical Society, 1998, xi + 239 pp.

From the Preface : Control theory finds itself on common ground with differential geometry and mechanics, and, as it reaches maturity, brings new insights and innovative methods to these classical subjects. The conference on Geometric Control Theory and Non-holonomic Problems in Mechanics, held in Mexico City, in June

1996, was organized around this theme and brought together researchers in all of these areas. The collection of nine papers in this volume, representative of the main interests at the conference, offers a distinctive sample of mathematical results indicative of new mathematical directions.

Several Complex Variables,

edited by Michael Schneider and Yum-Tong Siu, Mathematical Sciences Research Institute Publications 37, Cambridge University Press, 1999, xii + 564 pp.

From the Preface : This volume consists of sixteen articles written by participants of the 1995-96 Special Year in Several Complex Variables held at the Mathematical Sciences Research Institute in Berkeley, CA.

The field of Several Complex Variables is a central area of mathematics with strong interactions with partial differential equations, algebraic geometry and differential geometry. The MSRI programme emphasized these interactions and concentrated on developments and problems of current interest that capitalize on this interplay of

ideas and techniques.

This collection provides a picture of the status of research in these overlapping areas at the time of the conference, with some updates. It will serve as a basis for continued contributions from researchers and as an introduction to students. Most of the articles are surveys and expositions of results and techniques, often summarizing a vast amount of literature from a unified point of view. A few articles are more oriented towards researchers but nonetheless have expository sections. The volume is dedicated to the memory of Micheal Schneider, one of the editors of the Volume, who died in a rock-climbing accident in the French Alps in 1997.

Topics in Mathematical Economics and Game Theory,

Essays in Honor of Robert J. Aumann, edited by Myrna H. Wooders, Fields Institute Communications 23, American Mathematical Society, 1999, viii + 291 pp.

From the Preface : Since the publication of the Theory of Games by

John von Neumann and Oskar Morgenstern, game theory has played a continually increasing role in economics. It has also been of growing importance in other sciences, including biology, political science and psychology. Several scientists, such as John Harsanyi, Lloyd Shapley, Martin Shubik, Robert Aumann and Reinhard Selten (listed in order of age), have made early seminal contributions and have continued to be leaders in the field.

This volume contains a number of papers presented at the Fields Institute Conference «New Directions in the Theory of Markets and Games», organized by Kenneth Arrow, Sergiu Hart, Andreu Mas-Colell, Jean-Francois Mertens, Walter Trockel and Myrna Wooders (Chair), held in honor of Robert Aumann in 1995. The volume begins with a reprint of R. J. Aumann's insightful and thought-provoking work «Acceptable points in General Cooperative n -person Games». Papers in the volume are classified under Non-cooperative Game Theory, Cooperative Game Theory,

and Economics and Social Choice.

The Arithmetic and Geometry of Algebraic Cycles, Proceedings of the CRM Summer School, June 1998, at Banff, Alberta. CRM Proceedings and Lecture Notes, vol.24, Edited by B. Brent Gordon, James D. Lewis, Stefan Muller-Stach, Shuji Saito and Noriko Yui, American Mathematical Society, 2000, xiii + 432 pp.

The summer school mentioned in the title was held in June 7-19, 1998 and was organized simultaneously as a NATO Advanced Study Institute. This volume contains 20 articles by some of the participants of the summer school. The papers are organized into three categories : Cohomological Methods, Chow groups and Motives, and Arithmetic Methods. A technical description of the contents of each section is given in the Preface. An additional 21 articles are published in another volume by the Kluwer Academic Publishers in the NATO Advanced Study Institute Series.

FROM THE INSTITUTES

Second Canada-China Congress

The 3x3 Canada-China initiative, the Centre de Recherches Mathématiques, the Fields Institute for the Mathematical Sciences, the Pacific Institute for the Mathematical Sciences and the MITACS Network of Centers of Excellence have announced that a Second Canada-China Mathematical Congress will be held in Vancouver, August 20-25, 2001.

This initiative builds on the success of the first Canada-China 3x3 Congress held at Tsinghua University in August 1999, and is aimed at further developing the collaborative research effort between the two countries. Funding will also be available for the support of local and travel expenses within Canada of selected Chinese mathematical scientists who are planning extended visits to Canadian Universities around the dates of the Congress.

The congress will include sessions on number theory, mathematical physics, PDE and differential geometry, algebraic geometry, probability theory, signal processing and wavelets, computational and applied analysis, combinatorial optimization, topology, operator theory and functional analy-

sis, mathematical biology, mathematical statistics and mathematical finance.

Applications for support of visiting Chinese mathematical scientists should be addressed to the Director of the Pacific Institute for the Mathematical Sciences. More information can be found on the institutes' web pages.

MITACS Moves Headquarters

Last month the Mathematics of Information Technology and Complex Systems NCE (MITACS) moved its headquarters from the University of Toronto to Simon Fraser University. "This is the beginning of an exciting new era in mathematical research for SFU" said Dr. Bruce Clayman, Vice-President, Research at SFU. "With this move, Simon Fraser University is taking a leadership role in the fields of applied and industrial mathematics."

MITACS, a federally funded Network of Centres of Excellence (NCE), is devoted to industry-university research in the mathematical sciences. The network currently represents a \$3.7 million annual investment by the federal government

matched by \$1.5 million annually by Canadian industry.

Dr. Arvind Gupta, MITACS Program Leader and SFU associate professor of computing science appreciates the role that the University of Toronto played in getting MITACS off the ground. "The University of Toronto has been a terrific host, and we plan to continue working closely with the senior administration." The driving factor behind the decision to move the MITACS' headquarters to SFU was the advantage of having the scientific and administrative leadership under a single roof.

Dr. Gupta notes that MITACS has grown in less than two years to include more than 200 scientists at 26 universities working with over 300 students. "Today's knowledge-based economy increasingly relies on mathematical ideas for new product development. MITACS scientists are working with more than 75 Canadian companies, industries, financial institutions, hospitals, government departments, and foundations on problems ranging from fuel cell design to the prevention of the spread of infectious diseases."

Launched in October 1998, MITACS is a joint project of Canada's three mathematical institutes. The network consists of 23 research projects addressing five key sectors of the economy that will be crucial for Canada in the 21st century: biomedical, commercial/industrial, information technology, trade/finance, and manufacturing. Each project brings together industrial and university scientific expertise from across the country.

Report from CCARMS

The First Prairie Mathematics and Industry Workshop took place at Brandon University, August 7-11, 2000. Organised jointly by Lynn Batten (Deakin University), John Brewster (University of Manitoba), Doug Pickering (Brandon University) and Michael Tsatsomeros (University of Regina) for CCARMS (the Central Canadian Alliance for Research in the Mathematical Sciences), the workshop attracted 45 faculty, students and industry representatives, predominantly from the

provinces of Manitoba and Saskatchewan, to participate in the three industry problems brought to the meeting.

The format for the week was typical of those of similar industry workshops in Europe and Australia, as well as those recently introduced by Plms. The company representatives, Dr. Norman Corbett for the Department of National Defence, Dr. Daryl Dormuth for Atomic Energy of Canada Limited, Dr. Graeme Strathdee for Potash Corporation of Saskatchewan, posed their problems in 45 minute presentations to the full group. Then followed three days of intensive work by the participants, who selected their preferred areas of interest. Each of the problem sessions was assisted by an expert brought in by CCARMS for the occasion: Bob Blakely of Texas A & M University facilitated the AECL problem; Chris Budd, University of Bath, facilitated the DND problem; Tim Myers, Cranfield University, facilitated the Potash Corporation problem.

Each group successfully met the Friday deadline by having ready for presentation a summary of their work on the problem, along with recommendations for the company. These summaries are currently being written into reports which will be available on the website <http://www.math.brandonu.ca> in both English and French in the near future.

Social events throughout the week included a reception and lunch sponsored by Brandon University and a barbecue at the home of Doug Pickering. A special thanks to the Department of Mathematics which was most generous with its time, space, and in many other small but important ways.

CCARMS and the workshop organizers wish to thank the following organizations for funding support: the three Canadian Mathematical Institutes: CRM, Fields, Plms, Brandon University, the University of Manitoba, the Institute of Industrial Mathematical Sciences and Western Economic Diversification Canada.

The Second Prairie Mathematics and Industry Workshop is tentatively scheduled to be held at the University of Regina.

(ROSENTHAL—continued from page 1)

is claiming \$18,000 for false imprisonment, \$15,000 for malicious prosecution, and \$25,000 in punitive damages. That total, of, uh, let's see, uh" and the judge may interrupt, saying, with a smile, "I'm sure that Mr. Rosenthal will be very happy to help you with the mathematics."

On the other hand, there have been a few occasions when being a mathematician was genuinely useful in court. For example, in one case I was challenging the constitutionality of the provision of the Ontario Juries Act that requires that jurors be citizens of Canada. We had expert evidence showing that 3.2% of the citizens living in Toronto were black, whereas

4.1% of the residents of Toronto were black. Thus, we argued, the citizenship requirement had an adverse impact on the number of black people who would serve on juries. The Supreme Court of Canada had already determined that it was unconstitutional to require citizenship for lawyers, so we submitted that there was no countervailing justification for this discriminatory impact. We argued that the Act therefore had a discriminatory effect against the black man I was defending on a criminal charge.

In opposing this argument, the Crown Attorney claimed that, since the number of non-black non-citizens was greater than the number of black non-citizens, eliminating the citizenship requirement would lead to there being fewer blacks

on juries.

I explained the difference between absolute numbers and proportion as well as I could. The judge scowled at me (that judge scowled at me a lot during that long trial) and ultimately ruled against me (and sentenced my client to nine months in jail).

That much of the story was told by Ed Barbeau in his “Fallacies, Flaws, and Flimflam” column in the *College Mathematics Journal* (volume 28, in November 1997, page 377; the column includes a quotation from the legal brief of the Crown Attorney). In Barbeau’s column it was reported that the matter was under appeal; for those left in suspense, here’s what subsequently happened.

When the constitutionality of the Juries Act was argued on appeal, there were two Crown Attorneys, one representing each of the provincial and federal attorneys general. They both repeated the claim that eliminating the citizenship requirement would decrease the number of black jurors. This time, to the Court of Appeal, I explained the situation more fully. I’m not sure if any of the three judges completely followed it, but one of them said to the Crowns “Mr. Rosenthal is a mathematician, so he’s probably right on this one.” The Crowns then conceded as much. Nonetheless, afterwards one of the Crowns came up to me and said “I know you’re a mathematician and really understand these things, but if there are more white people than black people who aren’t jurors, how can eliminating the citizenship requirement put more black people on juries?” I explained again, but our conversation ended with his saying something like “I’m sure you’re right, but I don’t understand it.”

The Court of Appeal ruled against us anyway. They held that any increase in black people that would result from eliminating the citizenship requirement was too small to be significant. (On the other hand, they ordered a new trial on other grounds, and the Crown decided not to try again, so my client was not found guilty and didn’t go to jail. In another postscript to that case, I complained to the Canadian Judicial Council about the trial judge, not for “scowling” but for his refusing to allow spectators to sit in court wearing small caps in accordance with their religious practice as Muslims. The Judicial Council “expressed disapproval” of the judge’s ruling in that respect.)

So called “expert” witnesses are an interesting phenomenon; many would not be considered “expert” by any normal academic criteria. My being a mathematician has occasionally allowed me to cross-examine expert witnesses more thoroughly than they expected.

For example, I had a case in which I represented a young man who had been shot by a police officer as he and two friends fled after an attempted purse-snatching. The three were walking down the street when one of the friends took out a knife, ran ahead, cut the shoulder-strap of a woman’s purse, then dropped the purse and knife in a panic and ran

away. My client and the other boy also ran, in different directions. A police officer fired four shots at my client; two landed, one in his leg and the other in his shoulder.

The police wanted to establish that my client attempted to take the purse, in order to appear to make the shooting more justified. (Of course, there would have been no justification for the shooting even if my client had taken the purse.) At his criminal trial, the main evidence was from an alleged expert in forensic science. She testified that she had examined three different sets of fibres: some found on the knife that had been recovered from the scene, some taken from the purse strap, and some taken from my client’s jacket pocket. She said that some of the fibres on the knife matched those from the purse strap, showing that the knife had been used to cut the purse strap. She said that other fibres on the knife matched those taken from my client’s jacket, which demonstrated that the knife had been in my client’s jacket. The conclusion was that my client had been the person who had cut the strap with the knife.

In cross-examination, I asked her how she made the matches. She said that a certain dye was injected into each sample of fibres, and a graph was made showing the rate of absorption of the dye by the fibres. “If,” she explained, “I find that the graphs have the same flexions, then I call it a match.”

“What,” I asked her, “do you mean by the flexion of the graph?”

“Oh,” she said, adopting the haughty tone that “experts” sometimes use, “it’s very technical, but it has to do with the shape.”

“That’s okay,” I continued, “I’m a mathematician, get as technical as you like. What aspects of the shape are you talking about? The concavity? The curvature? What?”

The witness had become obviously flustered as I asked the question.

“Oh, you know, the shape,” she tried.

“What about the shape? How do you compare them?”

She had no explanation. We won the case.

In a murder case, I examined a purported expert on “blood stain pattern analysis.” Such experts are supposed to provide credible reconstructions of crimes by extrapolating from blood stains found at crime scenes. In our case, she testified about the positions of the victims at the time of stabbing, based on her analysis of blood stains on the walls and floor. I asked her “If a drop of blood is shot into the air, what sort of trajectory does it follow?”

She answered “It could follow an arc or a kind of arcing path.”

I asked if it had to follow a parabolic path, and she replied “That’s one of the shapes that’s possible. It’s going to depend on what force is involved in projecting it up.”

“What other possible shapes are there in your understanding?”

“You can have a square or a rectangle.”

There was another aspect of that murder case where mathematics was useful. A little knowledge of probability allowed me to, in my view, demonstrate that there were many holes in a DNA expert's report and knowledge. However, my client was convicted.

Unfortunately, instances such as the above, where my mathematical background is useful in court, are quite rare. Generally, mathematics and law are very separate (sometimes competing) parts of my life. They each provide great satisfaction, and some tension and unpleasantness. I'm glad I make a living as a math professor; I would not enjoy having to take

legal cases I didn't believe in just because I needed the money.

My understanding is that Fermat, on the other hand, made a living as a lawyer and was an amateur mathematician. I know that Fermat's mathematics was much better than mine (I'd take even Fermat's Little Theorem); I wonder if I'm as good a lawyer as he was? That's probably impossible to determine, since no one knows or cares about Fermat's practice of law. Interest in any particular aspect of law quickly evaporates, but good mathematics will survive and be of interest as long as humanity survives.

MINUTES OF THE ANNUAL GENERAL MEETING

Room 120, Togo Salmon Hall
McMaster University, Hamilton, Ontario
June 12, 2000

DRAFT

Pending approval

The meeting opened at 12:30 p.m. with 33 members in attendance.

1. Adoption of the agenda

The agenda was adopted, as circulated.

2. Minutes of the previous meeting

G-00-1 MOTION (Thompson/Goodaire) That the minutes of the General Meeting, held December 12, 1999 at the Montreal Conference Center, Montreal, Quebec, be accepted. *Carried Unanimously*

3. Matters Arising

There were no matters arising from the minutes.

4. President's Report

Kane noted that the 1999 Annual Report would be presented later in the meeting.

Kane announced that the Distinguished Service Award will be presented to Arthur Sherk (Toronto) at the banquet of the CMS Winter Meeting 2000, in Vancouver, B.C.

The Board of Directors has accepted the discontinuation of the General Meeting traditionally held at the Winter Meeting. There is still a mechanism in place to hold a general meeting, if necessary. A yearly meeting is required by law for incorporated societies and hence, the Annual General Meeting will take place during the Summer Meeting.

The Task Forces on Publications and Office Strategies have submitted final reports. The ad-hoc Committee on Electronic Services and Camel and the response of the Electronic Services Committee have also been received.

5. Treasurer's Report

Sherk presented the Treasurer's Report and the Audited Statement. The Operations Fund results were better than expected, with a surplus of approximately \$50,000. The main sources of revenue continue to be the subscription publications, and foreign exchange.

Sherk noted that three of the four divisions of the Operations Fund showed a deficit, which was not unexpected. This is largely due to the new equal assessment of administrative expenses between the four divisions of the Operations Fund.

Goodaire noted the CMS might be overly generous in paying travel expenses to our speakers. He thought that, apart from the invited plenary speakers, other societies did not.

G-00-2 MOTION (Board of Directors) That the Audited Statement for the financial year ended December 31, 1999 be accepted. *Carried Unanimously*

G-00-3 MOTION (Board of Directors) That the Treasurer's Report for the financial year ended December 31, 1999 be accepted. *Carried Unanimously*

G-00-4 MOTION (Board of Directors) That the firm of Raymond Chabot Grant Thornton be appointed as auditors for the financial year ending December 31, 2000.

6. 1999 Annual Report to the Members

The Annual Report was available for review. Extracts of the 1999 Annual Report will be published in the CMS Notes.

G-00-5 MOTION (Board of Directors) That the Annual Report to the Members be accepted, as amended. *Carried Unanimously*

7. Executive Director and Secretary's Report

Wright reported on the changes to the staff structure in Ottawa. A number of initiatives have increased the pressures on the staff, resulting, in some measure, with the departure of the two staff members most affected.

The Board has approved the creation of a new full-time accounting position, replacing two part-time positions. The Board has also approved the creation of a new part-time database clerk position.

Wright noted that all meeting web pages are now managed at the Ottawa office. This helps provide continuity in service and helps us build on the development of the web services from meeting to meeting.

In response to a question regarding the growing success of CMS semi-annual meetings, Sherk said that it was a mixture of good support from institutes and universities. Borwein said that our ability to expand the meeting format made it much easier for universities and agencies to support the meeting.

Wright gave a special thanks to the University of Waterloo and McMaster for their outstanding support of the special MATH2000 meeting.

Wright expressed his considerable thanks to Richard Kane for his Presidency during the last two years.

8. Reports from Committees

Mathematical Competitions: On behalf of Daryl Tingley, Wright reported on the growing Math Camps programme and the announcement of the IMO team members at the IMO Alumni luncheon, held in Toronto on June 11. Approximately 60 of the alumni attended, along with a number of others involved with the Canadian team over the last 20 years. The 2000 IMO team was announced: David Arthur, Daniel Brox, Denise Chung, Keon Choi, David Goodman, and David Pritchard.

Education: Barbeau congratulated Eric Muller and his colleagues for the rich programme at MATH 2000. He also invited people to contact him or his Committee regarding participation in future programmes. The Adrien Pouliot Award for 2000 will be announced shortly and he encouraged nominations for the next competition.

Electronic Services: Goodaire thanked the members of the CMS for participating in the recent review of Camel and electronic services. One of the results of this review was the creation of a number of positions, including the Director of Electronic Products and Services. It is hoped the new structure should be in effect in early 2001.

Camel now includes a prepublication area, which will include papers accepted for publication but for whom an issue of the CJM or CMB has not been assigned. Camel should soon have connections between mathsci-net and the Canadian journals.

Another new feature will be a database of problems from CRUX with MAYHEM. Bruce Shawyer has been working on this for years. Problems will be available for free. Solutions will be available to those holding subscriptions.

Digital Aftermath has been receiving very little traffic. Goodaire is looking for opinions regarding its potential demise. He noted that, should Digital Aftermath be taken

off-line, the underlying structure would still be preserved.

Endowment Grants: Wright reported that flyers for the 2000 Endowment Grants Competition are available. He invited members to review the successful applications on Camel.

Finance: Sherk reported on the investment portfolio. The funds are now in the hands of TD Quantitative Capital. He announced the newly-approved change in the asset mix for the Society's Restricted (Investment) Funds:

Canadian Bond Fund (Canadian Bond Index), 40%
Canadian Equity Fund (TSE 300 Index), 20%
Pooled U.S. Fund (S & P 500 Index), 20%
International Equity Fund (MSCI EAFE), 20%

Fund Raising Committee: Kane reported that the new format for fundraising has been increasingly effective. We have regular support from eight provinces and the private sector. Imperial Oil is supporting Math Camps. PIMS and SFU is supporting the training camp at SFU. Numerous other companies, institutes and university departments are supporting an increasingly varied programme of CMS activities.

CMS membership has increased to approximately 1,500, of which almost 600 are the result of the initiative to give free memberships to faculty and graduate students.

Eddy Campbell will be stepping down as the Chair of the Nominating Committee because of increased demands from his new university appointment. The Board has empowered the Executive to choose a replacement.

Publications: Mingo reported that the new series, namely the CMS Books in Mathematics, has announced its first four volumes. Springer-Verlag is planning a special launching event at the Vancouver meeting.

The CMS Conference Proceedings Series will be discontinued, at least in hardcopy version. A new series, entitled CMS Tracts in Mathematics, has been established with the American Mathematical Society. Ken Davidson and Cameron Stewart will serve as Editors-in-Chief.

Students: The the CUMC was organized this year by Gabrielle Couto. Only 40 students attended. Approximately 50 others could not attend because the conference was held too early in the summer. The timing of future CUMCs will be critical in both attracting more students and allowing the possibility of holding the CUMC jointly with the CMS.

The 2001 CUMC will take place at the Université Laval. Charbonneau encouraged mathematics department to send undergraduate students to Laval and think seriously about hosting a CUMC at their home university.

The Student Committee is also working on a "best-of" document to help future organizers.

Women in Mathematics: Dubiel reported on the Directory of Women in Mathematics and encouraged all women in math to contact them. She noted that getting access to the Directory via Camel is currently not very straightforward and

that the Committee is working with Camel to resolve these issues.

The Women in Math Poster is still in preparation. The project has received \$5,000 from Waterloo Maple.

9. Report from the Executive Committee

Richard Kane expressed his appreciation to all the members and the Executive Office, especially Graham Wright.

He welcomed Jonathan Borwein as the new President and noted Jonathan's wide and varied experience of the mathematical community in Canada.

Borwein stated that, during his term as President-Elect, he has become impressed with the support from the Executive Office and the stable level of volunteerism. Indeed he felt that

the CMS was one of the most stable professional associations in the country.

The challenges facing us now are challenges resulting from success, much preferable to the alternative. Borwein expressed his personal thanks to Richard Kane for looking after the Society so well. He looked forward to his mandate as President of the CMS.

10. Other Business

There was no other business.

11. Adjournment

The meeting adjourned at 1:45 p.m.

CALL FOR SESSIONS / APPEL AUX COMMUNICATIONS

Additional self-supported sessions play an important role in the success of the Society's semi-annual meetings. The CMS welcomes and invites proposals for self-supported sessions for **Summer 2002 (Université Laval, Québec, Québec)**.

Proposals should include a brief description of the focus and purpose of the session, the number and expected length of the talks, as well as the organizer's name, complete address, telephone number, e-mail address, etc. Although such sessions would not usually have a plenary speaker, any special situations are left to the discretion of the Meeting Director.

These additional sessions will be incorporated with the other sessions, time blocks allocated by the Meeting Director and advertised in the *CMS Notes*, on *Camel* and, if possible, in the *Notices of the AMS* and in publications of other societies. Speakers in these additional sessions will be requested to submit abstracts which will be published in the meeting programme.

The following provides information on the sessions confirmed to date.

Those wishing to organize a session should send a proposal to the Meeting Director by the deadline below.

Les sessions autofinancées contribuent de plus en plus au

succès des réunions semi-annuelles de la Société. La SMC encourage ces initiatives et invite les organisateurs(trices) potentiel(les) à soumettre leurs projets pour ce type de sessions à l'occasion de **la réunion d'été 2002 (Université Laval, Québec, Québec)**.

Les projets doivent inclure une brève description du thème et de la motivation de la session, le nombre et la durée des communications prévues, ainsi que le nom et les coordonnées physiques et électroniques de l'organisateur(trice). Bien qu'en général il n'y ait pas de conférences plénières de prévues pour ces sessions, les situations particulières sont laissées à la discrétion du directeur de la réunion.

Ces sessions additionnelles feront partie du programme, leur horaire sera établi par le directeur de la réunion, et elles seront publicisées dans les *Notes de la SMC*, sur *Camel* et, si possible, dans les *Notices de l'AMS* et les publications d'autres sociétés. Les conférenciers devront soumettre un résumé de leur communication, qui paraîtra dans le programme de la réunion.

Toute personne désireuse d'organiser une session doit faire parvenir un projet au directeur de réunion avant la date ci-dessous.

Deadline: March 15, 2001 / Date limite : le 15 mars 2001

Analysis / Analyse

Thomas Ransford (Laval)

Arithmetic Algebraic Geometry / Géométrie algébrique arithmétique

Kumar Murty (Toronto)

Differential Geometry / Géométrie différentielle

Jingyi Chen (UBC)

Graph Theory / Théorie des graphes

Brian Alspach (Simon Fraser)

Claude Levesque, Meeting Director / Directeur de la réunion

Département de mathématiques et statistique
Université Laval

Faculté des sciences et de génie

Québec, Québec Canada G1K 7P4

Tel: (418) 656-5660 Fax: (418) 656-2817

e-mail: cl@mat.ulaval.ca

CMS Summer Meeting 2001 June 2-4

University of Saskatchewan
Saskatoon, Saskatchewan

We are happy to announce the provisional outline for the Canadian Mathematical Society Summer Meeting 2001. Look for the First Announcement in the February 2001 issue of the *CMS Notes* or at <http://www.cms.math.ca/Events/summer01>.

HOST : Department of Mathematics & Statistics, University of Saskatchewan.

PUBLIC LECTURE : **De Witt Sumners** (Florida State). The lecture will be held at the University of Saskatchewan, June 2, 2001.

PLENARY SPEAKERS : **Georgia Benkart** (Wisconsin), **Zoe Chatzidakis** (Paris 7), **Geoffrey Grimmett** (Cambridge), **Barry Simon** (Caltech).

PRIZES : Jeffery-Williams Lecture, **David Boyd** (UBC), and the Krieger-Nelson Lecture, **Lisa Jeffrey** (Toronto).

SYMPOSIA : **Abstract Harmonic Analysis**, Org: Keith Taylor (Saskatchewan) and Anthony T. Lau (Alberta); **Dynamics and Symmetry** Org: G. Patrick (Saskatchewan); **Geometric Topology**, Org: A. Chigogidze and E. Tymchatyn (Saskatchewan); **Graph Theory**, Org: Brian Alspach and Denis Hanson (Regina); **Infinite dimensional Lie theory and representation theory**, Org: S. Berman (Saskatchewan); **Mathematical Education**, Org: Florence Glanfield (Saskatchewan); **Matrix Analysis** Org: Judith MacDonald (Regina); **Model theoretic algebra**, Org: Bradd Hart (McMaster/Fields Institute), F.-V. Kuhlmann and S. Kuhlmann (Saskatchewan); **Number Theory - in Honour of David Boyd**, Org: Peter Borwein (Simon Fraser) and M. Bennett (Illinois U-C); **Rigorous studies in the statistical mechanics of lattice models**, Org: Chris Soteris (Saskatchewan) and S.G. Whittington (Toronto); **Scattering theory and integrable systems**, Org: J. Szmigielski (Saskatchewan).

MEETING DIRECTOR : Keith Taylor (Saskatchewan).

LOCAL ARRANGEMENTS : Chris Soteris (Saskatchewan).

UPCOMING CONFERENCES

13-th International Conference on Formal Power Series and Algebraic Combinatorics Arizona State University, Arizona - USA, May 20 – 26, 2001

Topics :

Algebraic and bijective combinatorics and its relation with other parts of mathematics, combinatorial and computer algebra, computer science and physics.

Conference Program :

Invited lectures, contributed presentations, poster sessions, problem sessions and software demonstrations. A special session will be dedicated to the work of Rodica Simion. Co-authors of Rodica Simion are encouraged to send a poster presentation of their joint work.

Official Languages :

The official languages of the conference are English, French and Spanish.

Important deadlines :

Papers : Submission before November 15, 2000, Acceptance / Registration scheduled by January 15, 2001 Software : Submission before January 15, 2001 Open problems : Submission before May 1, 2001

Chairpersons of the program committee :

Hélène Barcelo (Arizona State University, USA) and Volkmar Welker (Philipps-Universität Marburg, Germany)

More information can be found at the following URL: <http://math.la.asu.edu/fpsac01> or by sending email to: fpsac01@asu.edu

Réunion d'été 2001 de la SMC du 2 au 4 juin

Université de Saskatchewan Saskatoon (Saskatchewan)

Voici le programme provisoire de la Réunion d'été 2001 de la Société mathématique du Canada. La première annonce paraîtra dans le numéro de février 2001 des *Notes de la SMC* et sur notre site Web: <http://www.cms.math.ca/Events/summer01>.

HÔTE : Département de mathématiques et statistiques, Université de Saskatchewan.

CONFÉRENCE PUBLIQUE : **De Witt Sumners** (Florida State). La conférence aura lieu à l'Université de Saskatchewan, le 2 juin 2001.

CONFÉRENCIERS PRINCIPAUX : **Georgia Benkart** (Wisconsin), **Zoe Chatzidakis** (Paris 7), **Geoffrey Grimmett** (Cambridge), **Barry Simon** (Caltech).

PRIX : Conférence Jeffery-Williams, **David Boyd** (UBC), et Conférence Krieger-Nelson, **Lisa Jeffrey** (Toronto).

SYMPOSIUMS : **Analyse harmonique abstraite**, Org: Keith Taylor (Saskatchewan) et Anthony T. Lau (Alberta); **Dynamique et symétrie** Org: G. Patrick (Saskatchewan); **Topologie géométrique**, Org: A. Chigogidze et E. Tymchatyn (Saskatchewan); **Théorie des graphes**, Org: Brian Alspach et Denis Hanson (Regina); **Théorie de Lie en dimension infinie et théorie des représentations**, Org: S. Berman (Saskatchewan); **Enseignement des mathématiques**, Org: Florence Glanfield (Saskatchewan); **Analyse matricielle** Org: Judith MacDonald (Regina); **Algèbre en théorie des modèles**, Org: Bradd Hart (McMaster/Fields Institute), F.-V. Kuhlmann and S. Kuhlmann (Saskatchewan); **Théorie des nombres - en honneur de David Boyd**, Org: Peter Borwein (Simon Fraser) and M. Bennett (Illinois U-C); **Études rigoureuses dans la mécanique statistique des modèles de réseaux**, Org: Chris Soteris (Saskatchewan) et S.G. Whittington (Toronto); **Diffusion inverse et systèmes intégrables**, Org: J. Szmigielski (Saskatchewan).

DIRECTEUR DE RÉUNION : Keith Taylor (Saskatchewan).

LOGISTIQUE LOCALE : Chris Soteris (Saskatchewan).

UPCOMING CONFERENCES

Australian Mathematical Society

Applications of Discrete Mathematics

Australian National University, Canberra, September 22 – 26, 2001

At the 45th meeting of the Australian Mathematical Society, to be held at the Australian National University, Canberra, September 22 to 26 inclusive, 2001, a special session entitled Applications of Discrete Mathematics is being organized by Lynn Batten (Deakin) and Ian Roberts (Northern Territory University).

The session will accommodate about twenty speakers over the four and a half day period, including presentations by students. The focus of the session will be on all applications of discrete mathematics.

Contact Ian Roberts at iroberts@darwin.ntu.edu.au or Lynn Batten at lbatten@deakin.edu.au for details on the special session.

More information about the meeting will soon be available on the Australian Mathematical Society website (www.austms.org.au). Financial support is available for students presenting a paper who are members of the Society.

SÉMINAIRE DE MATHÉMATIQUES SUPÉRIEURES – NATO ADVANCED STUDY INSTITUTE

Université de Montréal, July 9 – 20, 2001

MODERN METHODS IN SCIENTIFIC COMPUTING AND APPLICATIONS**LECTURERS:**Zh. BAI (UC at Davis) - G.H. GOLUB (Stanford): *Matrices, moments, and quadratures*A.L. BERTOZZI (Duke) - T.P. WITELSKI (Duke): *Emerging computational problems in thin films and fluid interfaces*A. BOURLIOUX (Montréal): *Numerical combustion: modelling and computing turbulent flamelets*P. SOUGANIDIS (Texas at Austin): *Moving fronts in phase transition and combustion*G. HAASE (Linz) - U. LANGER (Linz): *Multigrid methods: theory, algorithms, implementation, parallelization*L. HALPERN (Paris 13 / EP Paris) - F. NATAF (EP Paris): *Domain decomposition methods*A. HUMPHRIES (Sussex) - A. STUART (Warwick): *Computational aspects of deterministic and random dynamical systems*K. MIKULA (TU Bratislava): *Image processing with nonlinear partial differential equations*J.A. SETHIAN (Berkeley): *Advances in image processing: applications of evolution techniques to image denoising, segmentation, and analysis*G. PAPANICOLAOU (Stanford): *Asymptotic analysis of stochastic differential equations and applications*R. SIRCAR (Princeton): *Stochastic volatility modelling***Deadline for application: February 28, 2001.****Information:** G. David, Dép. mathématiques & statistique, Univ. de Montréal, CP 6128/Centre-ville, Montréal (Qc) H3C 3J7, T (514) 343-6710, F (514) 343-5700, sms@dms.umontreal.ca; <http://www.dms.umontreal.ca/sms>**AMERICAN UNIVERSITY OF SHARJAH (AUS) – UNITED ARAB EMIRATES
DEPARTMENT OF COMPUTER SCIENCE, MATHEMATICS AND STATISTICS**

Applications are invited for positions at the rank of Assistant Professor of mathematics starting on August 24, 2001. Strong candidates from all areas will be considered with a preference to applicants from an area of computational and applied mathematics. The Department of Computer Science, Mathematics and Statistics is committed to lively teaching integrating educational technology and to active research. Candidates are required to have a Ph.D. in Mathematics, a demonstrated excellence in teaching, and evidence/strong potential for research. While AUS emphasizes undergraduate teaching, peer reviewed research is required for retention and promotion.

Located in the United Arab Emirates, AUS is a non-profit, coeducational institution of higher education formed on the American model. Faculty at AUS receive a tax free competitive salary and an attractive benefits package that includes free on-campus furnished housing and utilities, a yearly travel allowance, and a generous educational allowance for dependent children. Information on AUS and contracts can be found on the AUS web site <http://www.aus.ac.ae>. Positions are open until filled, with preference to early applications. Please e-mail a CV and a letter of application including the names and addresses of three references to:

Robert D. Cook,
Dean, College of Arts and Sciences,
Chaimaa@aus.ac.ae

Mathematical Sciences

University of Alberta. One tenure-track position at Assistant Professor level is available in Geometric Functional Analysis, more particularly in any of the areas of asymptotic theory of normed spaces, including related probabilistic methods; the structure and geometry of infinite-dimensional Banach spaces; convex geometric analysis or related non-commutative theories. We are looking for a person with a strong record and outstanding potential for research, excellent communication and teaching skills, and a commitment to undergraduate and graduate education. Current research strengths in the analysis group of the Department include geometric functional analysis, approximation theory, Fourier and harmonic analysis, Banach and C^* -algebras, wavelet analysis. In accordance with Canadian Immigration requirements, this advertisement is directed to Canadian citizens and permanent residents. If suitable Canadian citizens and permanent residents cannot be found, other individuals will be considered. Applications should include a curriculum vitae (including a list of publications), a research plan and a teaching dossier. Candidates should arrange for at least three confidential letters of reference to be sent to: A. H. Rhemtulla, Chair, Department of Mathematical Sciences, **University of Alberta**, Edmonton, Alberta T6G 2G1. Canada. The closing date for applications is Friday, January 12, 2001 or until a suitable candidate is found. Early applications are encouraged. For more information about the Department and our University, please see our web page: www.math.ualberta.ca. The records arising from this competition will be managed in accordance with provisions of the Alberta Freedom of Information and Protection of Privacy Act (FOIPP). The University of Alberta hires on the basis of merit. We are committed to the principle of equity in employment. We welcome diversity and encourage applications from all qualified women and men, including persons with disabilities, members of visible minorities, and Aboriginal persons.

Actuarial Science (AS 2001)

The Department of Mathematical Sciences, University of Alberta invites applications for an Assistant Professor tenure track position in Actuarial Science. We are looking for a person with a strong record/outstanding potential for research, excellent communication and teaching skills and leadership potential. Applicants must have a PhD in an area of mathematics or statistics. Current research interests must be closely related to actuarial science. The appointee will also be expected to possess or acquire actuarial qualifications to the level of Associateship in the Society of Actuaries or equivalent. Applications should include a curriculum vitae, a research plan, and a teaching dossier. Candidates should arrange for at least three confidential letters of reference to be sent to: A.H. Rhemtulla, Chair, Department of Mathematical Sciences, **University of Alberta**, Edmonton, Alberta, Canada, T6G 2G1. The closing date for applications is Friday, March 30, 2001 or until a suitable candidate is found. Early applications are encouraged. For more information about the Department and our University, please see our web page: www.math.ualberta.ca. The records arising from this competition will be managed in accordance with provisions of the Alberta Freedom of Information and Protection of Privacy Act (FOIPP). The University of Alberta hires on the basis of merit. We are committed to the principle of equity in employment. We welcome diversity and encourage applications from all qualified women and men, including persons with disabilities, members of visible minorities, and Aboriginal persons.

CALL FOR NOMINATIONS / APPEL DE CANDIDATURES CMS Distinguished Service Award / Prix de la SMC pour service méritoire

In 1995, the Society established this award to recognize individuals who have made sustained and significant contributions to the Canadian mathematical community and, in particular, to the Canadian Mathematical Society.

The first awards were presented at the 1995 Winter Meeting in Vancouver to Donald Coxeter, Nathan Mendelsohn, John Coleman, Maurice L'Abbé and George Duff. Awards were presented at the 1996 Winter Meeting in London, Ontario to David Borwein and P.G. (Tim) Rooney, the 1999 Summer Meeting in St. John's, Newfoundland to Michael Doob and S. Swaminathan. The 2000 award will be presented at the Winter Meeting in Vancouver, British Columbia to Arthur Sherk.

Nominations should include a reasonably detailed rationale and be submitted by **March 31, 2001**, to the address below.

Selection Committee / Comité de sélection
Distinguished Service Award / Prix pour service méritoire
577 King Edward, Suite 109
C.P./P.O. 450, Succursale / Station A
Ottawa, Ontario K1N 6N5 Canada

En 1995, la Société mathématique du Canada a créé un nouveau prix pour récompenser les personnes qui contribuent de façon importante et soutenue à la communauté mathématique canadienne et, notamment, à la SMC.

Les premiers lauréats, Donald Coxeter, Nathan Mendelsohn, John Coleman, Maurice L'Abbé et George Duff, furent honorés lors de la réunion d'hiver 1995 à Vancouver. Les lauréats, David Borwein et P.G. (Tim) Rooney, furent honorés lors de la réunion d'hiver 1996 à London, Ontario. Les prochains lauréats, Michael Doob et S. Swaminathan, est honorés à la réunion d'été 1999 à St. John's, Terre-Neuve. Arthur Sherk sera honoré à la réunion d'hiver 2000 au Vancouver, Colombie-britannique.

Pour les mises en candidature prière de présenter des dossiers suffisamment détaillés et de les faire parvenir, le **31 mars 2001** au plus tard, à l'adresse ci-dessous.

MCGILL UNIVERSITY – MONTREAL, QUEBEC
DEPARTMENT OF MATHEMATICS AND STATISTICS
Canada Research Chairs

The Department of Mathematics and Statistics of McGill University invites applications from highly qualified candidates for sponsorship to compete for Canada Research Chairs at both the senior and junior levels.

An offer of a tenured or tenure track position may precede the sponsorship for competition. Competitive salary and attractive fringe benefits are offered by McGill University.

This advertisement is addressed to Canadian citizens and non Canadians alike.

Applications with a curriculum vitae, a list of publications, a research proposal, an account of teaching experience and the names, phone numbers and e-mail addresses of at least four references (with one addressing the teaching record) should be sent to:

Dr. K. GowriSankaran, Chair
Department of Mathematics and Statistics
McGill University
805 Sherbrooke St. West
Montreal, Quebec, Canada H3A 2K6
Email: chair@math.mcgill.ca

McGill University is committed to equity in employment.

MCGILL UNIVERSITY – MONTREAL, QUEBEC
DEPARTMENT OF MATHEMATICS AND STATISTICS
Assistant Professor

The Department of Mathematics and Statistics of McGill University invites applications for a tenure track position in statistics at the assistant professor level.

A Ph.D. degree in statistical science is essential. Preferred areas of specialization are computational statistics, sample surveys and time series analysis, although not exclusively so. Preference will be given to applicants with a strong theoretical background in statistics, whose work is driven by applications.

The appointment is to begin July 1, 2001.

Applicants are expected to have demonstrated the capacity for independent research of excellent quality. Selection criteria include research accomplishments, as well as potential contributions to the research interests of the Department and to its educational programs at both the undergraduate and graduate levels.

Applications, with a curriculum vitae, a list of publications, a research proposal, an account of teaching experience and the names, phone numbers and e-mail addresses of at least four references (with one addressing the teaching record) should be sent to:

Dr. K. GowriSankaran, Chair
Department of Mathematics and Statistics
McGill University
805 Sherbrooke St. West
Montreal, Quebec, Canada H3A 2K6
Email: chair@math.mcgill.ca

Candidates must arrange to have the letters of recommendation sent directly to the above address. Candidates are also encouraged to include copies of up to 3 selected publications with their application.

To ensure full consideration, applications must be received by **January 15, 2001**, although the search will continue until the position is filled.

All outstanding candidates will be considered. However, in accordance with the Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada. McGill University is committed to equity in employment.

MCGILL UNIVERSITY – MONTREAL, QUEBEC

The Department of Atmospheric and Oceanic Sciences together with the Department of Mathematics and Statistics (both of McGill University) invite applications for a joint tenure track position, at the assistant professor level.

The area of the appointment will lie in dynamic meteorology (such as waves and turbulence) and scientific computation.

Applicants are expected to have demonstrated the capacity for independent research of excellent quality. Selection criteria include research accomplishments, as well as potential contributions to the educational programs of both departments at the undergraduate and graduate level.

Applications with a curriculum vitae, a list of publications, a research outline, an account of teaching experience and the names, phone numbers and e-mail addresses of at least four references (with one addressing the teaching record) should be sent to

Dr. K. GowriSankaran, Chair
Department of Mathematics and Statistics
McGill University
805 Sherbrooke St. West
Montreal, Quebec, Canada H3A 2K6
Email: chair@math.mcgill.ca

Candidates must arrange to have the letters of recommendation sent directly to the above address. Candidates are encouraged to include copies of up to 3 selected publications or preprints accepted for publication with their applications.

To ensure full consideration, applications must be received by **January 15, 2001**.

In accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada. However, all outstanding candidates will be considered. McGill University is committed to equity in employment.

MCGILL UNIVERSITY – MONTREAL, QUEBEC DEPARTMENT OF MATHEMATICS AND STATISTICS

The Department expects to fill several tenure-track positions in the coming academic year. Two immediate priorities are in the following areas:

a. **Statistics:** A Ph.D. degree in statistical science is essential. Preferred areas of specialization are computational statistics, sample surveys and time series analysis, although not exclusively so. Preference will be given to applicants with a strong theoretical background in statistics, whose work is driven by applications.

b. **Applied Mathematics:** Preferred areas for this appointment include stochastic differential equations, material science and continuous or discrete optimization. Candidates will be expected to have considerable expertise in scientific computation.

Applicants should have a strong background in mathematics and have demonstrated the capacity for independent research of excellent quality. Selection criteria include research accomplishments, as well as potential contributions to the educational programs of the department at the graduate and undergraduate levels.

Applications with a curriculum vitae, a list of publications, a research outline, an account of teaching experience, a statement on teaching and the names, phone numbers and e-mail addresses of at least four references (with one addressing the teaching record) should be sent to

Dr. K. GowriSankaran, Chair
Department of Mathematics and Statistics
McGill University
805 Sherbrooke St. West
Montreal, Quebec, Canada H3A 2K6
Email: chair@math.mcgill.ca

Candidates must arrange to have the letters of recommendation sent directly to the above address. Candidates are encouraged to include copies of up to 3 selected publications or preprints accepted for publication with their applications.

To ensure full consideration, applications must be received by **January 15, 2001**.

In accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada. However, all outstanding candidates will be considered. McGill University is committed to equity in employment.

UNIVERSITY OF TORONTO – TORONTO, ONTARIO
DEPARTMENT OF MATHEMATICS
Tenure-Stream Appointments in Mathematics

The University of Toronto solicits applications for two tenure-stream appointments in the Department of Mathematics, with one position in the area of Algebra or Number Theory, the other in Geometric Analysis, Gauge Theory or Symplectic Topology. It is intended to nominate the successful applicants for a Canadian Research Chair, at either junior or senior level. Accordingly, candidates are expected to be outstanding mathematicians, whose research and teaching will make major contributions to the quality and stature of the department.

The appointments are at open rank, to begin July 1, 2001. Salary commensurate with experience.

Applicants should send a complete C.V., a short statement about their research programme, and appropriate material about their teaching. They should also submit the names of four mathematicians who could be consulted about their work.

The application should be sent directly to:

Search Committee
Department of Mathematics
University of Toronto
100 St. George Street, Room 4072
Toronto, Canada M5S 3G3

In addition, it is recommended that applicants submit the electronic application form at www.math.toronto.edu/jobs. The position code is CRC.

To ensure full consideration, the application should be received by **January 31, 2001**.

The University of Toronto is strongly committed to diversity within its community. The University especially welcomes applications from visible minority group members, women, Aboriginal persons, persons with disabilities, and others who may add to the diversity of ideas.

Any inquiries about the application should be sent to ida@math.toronto.edu

McMASTER UNIVERSITY – HAMILTON, ONTARIO
DEPARTMENT OF MATHEMATICS & STATISTICS
Canada Research Chair

The Department of Mathematics & Statistics, McMaster University, invites applications for a junior Canada Research Chair starting July 1, 2001.

Candidates should have a Ph.D., be identifiable as having the potential to lead their fields in research, and have demonstrated interest and ability in teaching. Appointments will be made in accordance with the University Strategic Plan. See our web page <http://www.science.mcmaster.ca/MathStat/Dept.html> for the Department's Strategic Plan. The salary and rank will be based on qualifications and experience. Normally the appointment will be made at the tenure-track assistant or associate professor level, but tenure may be offered in exceptional circumstances.

McMaster is committed to Employment Equity and encourages applications from all qualified candidates, including aboriginal peoples, persons with disabilities, members of visible minorities and women.

Applications, including curriculum vitae and three letters of reference, should be received before **January 15, 2001**, by:

Chair of Search Committee
Mathematics & Statistics
McMaster University
Hamilton, Ontario
Canada, L8S 4K1

YORK UNIVERSITY – TORONTO, ONTARIO
DEPARTMENT OF MATHEMATICS AND STATISTICS
Probability

Applications are invited for a two-year contractually limited appointment for 2001–2003 at the Assistant Professor level in the Department of Mathematics and Statistics. The position is subject to budgetary approval, and is scheduled to commence by 1 September 2001. The successful applicant must have a PhD and is expected to show evidence or promise of good quality teaching, and research in Probability Theory or Stochastic Processes. The selection process will begin **January 15, 2001**. Applicants should send resumes and arrange for three letters of reference (one of which should address teaching) to be sent directly to:

Probability Search Committee
Department of Mathematics and Statistics
York University
4700 Keele Street
Toronto, Ontario, Canada M3J 1P3
Fax: (416) 736-5757
E-mail: chair@mathstat.yorku.ca, www.math.yorku.ca/Hiring/

As required by Canadian immigration, this advertisement is directed to citizens or permanent residents of Canada. For many years, York University has had a policy of employment equity including affirmative action for women faculty and librarians. Recently, York has included racial/visible minorities, persons with disabilities and aboriginal peoples in its affirmative action program. Persons who are members of one or more of these three groups are encouraged to self identify during the selection process. Please note that candidates from these three groups will be considered within the priorities of the affirmative action program only if they self identify. The Department of Mathematics and Statistics welcomes applications from women, racial/visible minorities, persons with disabilities and aboriginal peoples. If additional assistance is required, the York affirmative action office can be reached at (416)736-5713.

CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

DECEMBER 2000

9–13 The Ninth International Workshop on Matrices and Statistics, in celebration of C.R.Rao's 80th birthday, (Osmania University, Hyderabad, India).

<http://eos.ect.uni-bonn.de/HYD2000.htm>

10–12 CMS Winter Meeting / Réunion d'hiver de la SMC (Hotel Vancouver, Vancouver, B. C.)

<http://www.cms.math.ca/CMS/Events/winter00>

JANUARY 2001

9–14 Quasiclassical and Quantum Structures, in the Symplectic Topology, Geometry, and Gauge Theory Program (Fields Institute, Toronto and CRM, Montreal)

<http://www.fields.utoronto.ca/symplectic.html>

10–13 Joint Mathematics Meeting. AMS & MAA (New Orleans Marriott ITT Sheraton New Orleans Hotel, New Orleans, Louisiana) <http://www.ams.math.org/meetings/>

MARCH 2001

25–30 Sixth International Conference on Approximation and Optimization, (Guatemala City, Guatemala)

<http://www.ing.usac.edu.gt/apopt6/>

DÉCEMBRE 2000**JANVIER 2001****MARS 2001**

26–April 7 Symplectic and Contact Topology, Field Theory and Higher Dimensional Gauge Theory, in the Symplectic Topology, Geometry, and Gauge Theory Program (Fields Institute, Toronto and CRM, Montreal)

<http://www.fields.utoronto.ca/symplectic.html>

MAY 2001

25–29 Annual meeting of the Canadian Mathematics Education Study Group, (University of Alberta, Edmonton)

<http://cmesg.math.ca>

25–27 Annual meeting and special session on French mathematics, Canadian Society for History and Philosophy of Mathematics / Société canadienne d'histoire et de philosophie des mathématiques (Université Laval, Québec)

<http://www.cshpm.org>

JUNE 2001

2–4 CMS Summer Meeting / Réunion d'été de la SMC (University of Saskatchewan, Saskatoon, Saskatchewan)

<http://www.cms.math.ca/CMS/Events/summer01>

4–13 Hamiltonian Group Actions and Quantization, in the Symplectic Topology, Geometry, and Gauge Theory Program

MAI 2001**JUIN 2001**

(Fields Institute, Toronto and CRM, Montreal)

<http://www.fields.utoronto.ca/symplectic.html>

JULY 2001**JUILLET 2001**

9–20 Séminaire de mathématiques supérieures NATO Advanced Study Group (Université de Montréal, Montréal, Québec) <http://www.dms.umontreal.ca/sms>

16–21 COCOA VII - The Seventh International Conference on Computational Commutative Algebra (Queen's University, Kingston, Ontario) A. Geramita (tony@mast.queenu.ca) <http://cocoa.dima.unige.it/>

AUGUST 2001**AOÛT 2001**

7–9 Nordic Conference on Topology and its applications, NORDTOP 2001, (Sophus Lie Centre at Nordfjordeid, Norway) nordtop2001@mail.mathatlas.yorku.ca

SEPTEMBER 2001**SEPTEMBRE 2001**

22–26 Applications of Discrete Mathematics, Australian Mathematical Society (Australian National University, Canberra)

Ian Roberts: iroberts@darwin.ntu.edu.au or Lynn Batten: lmbatten@deakin.edu.au

DECEMBER 2001**DÉCEMBRE 2001**

8–10 CMS Winter Meeting / Réunion d'hiver de la SMC (Toronto Colony Hotel, Toronto, Ontario)

<http://www.cms.math.ca/CMS/Events/winter01>

MAY 2002**MAI 2002**

3–5 AMS Eastern Section Meeting (CRM, Université de Montreal) <http://www.ams.math.org/meetings/>

JUNE 2002**JUIN 2002**

CMS Summer Meeting / Réunion d'été de la SMC (Université Laval, Québec, Québec)

Monique Bouchard: meetings@cms.math.ca

6–8 CAIMS 2002 (University of Calgary, Calgary, Alberta) Samuel Shen: shen@maildrop.srv.ualberta.ca

AUGUST 2002**AOÛT 2002**

20–28 International Congress of Mathematicians, (Beijing, China)

cms@math08.math.ac.cn; <http://icm2002.org.cn/>

DECEMBER 2002**DÉCEMBRE 2002**

8–10 CMS Winter Meeting / Réunion d'hiver de la SMC (University of Ottawa / Université d'Ottawa, Ottawa, Ontario)

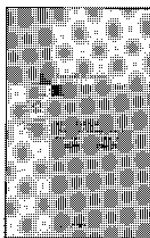
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T. LIGGETT, University of California, Los Angeles

STOCHASTIC INTERACTING SYSTEMS
Contact, Voter and Exclusion Processes

Interactive particle systems is a branch of probability theory with close connections to mathematical physics and mathematical biology. The author's first book on this topic, *Interacting Particle Systems*, published in 1985, represented the subject as it was at that time. This present book takes three of the most important models in the area, and traces advances in the area since then. In doing so, many of the most useful techniques in the field are explained and developed, so that they can be applied to other models and in other contexts. This book is intended for graduate students and researchers in probability theory, and in related areas of mathematics, biology, and physics.

1999/368 PP./HARDCOVER/\$39.00/ISBN 3-640-65995-1
GRUNDLEHREN DER MATHEMATISCHEN WISSENSCHAFTEN, VOL. 324

ALSO BY T. LIGGETT

INTERACTING PARTICLE SYSTEMS

1985/HARDCOVER/\$122.00/ISBN 0-387-96069-4

GEORGE R. SELL, University of Minnesota, Minneapolis;
YUNCHENG YOU, University of South Florida, Tampa

DYNAMICS OF EVOLUTIONARY EQUATIONS

The theory and applications of infinite dimensional dynamical systems have attracted the attention of scientists for quite some time. Dynamical issues arise in equations which attempt to model phenomena that change with time, and the infinite dimensional aspects occur when forces that describe the motion depend on spatial variables. This book may serve as an entree for scholars beginning their journey into the world of dynamical systems, especially infinite dimensional spaces. The main approach involves the theory of evolutionary equations. It begins with a brief essay on the evolution of evolutionary equations and introduces the origins of the basic elements of dynamical systems, flow and semiflow.

2001/616 PP., 20 ILLUS./HARDCOVER/\$79.00
ISBN 0-387-98347-3
APPLIED MATHEMATICAL SCIENCES, VOL. 143



LARRY J. GERSTEIN, University of California, Santa Barbara

INTRODUCTION TO MATHEMATICAL STRUCTURES AND PROOFS

This textbook is intended for a one term course whose goal is to ease the transition from lower division calculus

courses, to upper level courses in algebra, analysis, number theory and so on. Without such a "bridge course", most instructors in advanced courses feel the need to start their courses with a review of the rudiments of logic, set theory, equivalence relations, and other basic mathematics before getting to the subject at hand. Students need experience in working with abstract ideas at a nontrivial level if they are to achieve what we call "mathematical maturity", in other words, to develop an ability to understand and create mathematical proofs. Part of this transition involves learning to use the language of mathematics. This text spends a good deal of time exploring the judicious use of notation and terminology, and in guiding students to write up their solutions in clear and efficient language. Because this is an introductory text, the author makes every effort to give students a broad view of the subject, including a wide range of examples and imagery to motivate the material and to enhance the underlying intuitions. The exercise sets range from routine exercises, to more thoughtful and challenging ones.

1996/350 PP., 103 ILLUS./HARDCOVER/\$59.95
ISBN: 0-387-97997-2

TEXTBOOKS IN MATHEMATICAL SCIENCES

R. CRANDALL, Reed College, Portland, OR;
C. POMERANCE, Bell Labs, Murray Hill, NJ

PRIME NUMBERS

A Computational Perspective

The basic notion of primality can be accessible to a child, yet no human mind harbors anything like a complete picture. In this book the authors concentrate on the computational aspect of finding and characterizing primes. The book will be an indispensable reference for professionals interested in prime numbers and encryption, cryptography, factoring algorithms, elliptic curve arithmetic, and many more computational issues related to primes and factoring. Readers can test their understanding at the end of each chapter with a variety of exercises ranging from very easy to extremely difficult.

2000/APPROX. 352 PP./HARDCOVER/\$49.95
ISBN 0-387-94777-9

DAVID H. ARMITAGE, The Queen's University, Belfast, UK;
STEPHEN J. GARDINER, University College, Dublin, Ireland

CLASSICAL POTENTIAL THEORY

From its origins in Newtonian physics, potential theory has developed into a major field of mathematical research. This book provides a comprehensive treatment of classical potential theory: it covers harmonic and subharmonic functions, maximum principles, polynomial expansions, Green functions, potentials and capacity, the Dirichlet problem and boundary integral representations. The first six chapters deal concretely with the basic theory, and include exercises. The final three chapters are more advanced and treat topological ideas specifically created for potential theory, such as the fine topology, the Martin boundary and minimal thinness. The presentation is largely self-contained and is accessible to graduate students, the only prerequisites being a reasonable grounding in analysis and several variables calculus, and a first course in measure theory. The book will prove an essential reference to all those with an interest in potential theory and its applications.

2000/352 PP./HARDCOVER/\$84.95/ISBN 1-85233-618-8

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