Université de Montréal

A WORD FROM THE DIRECTOR

As September rolls around again, the CRM is gearing up for a new academic year, whose theme is the mathematical sciences in biology and medicine. The whole area is one which has seen explosive growth in recent years, and a glance at our programme gives some idea of the development of the subject. Jacques Bélair, in the next column, gives a survey of the year; I would like to take this opportunity to thank Jacques, David Sankoff, and all the other members of the programme committee for putting together what promises to be an exciting array of events.

As soon as one year's events are all sorted out, of course, we have to begin planning for the next. The year 2001-2002 is being organized around the theme of *Groups and geometry* . (It has been remarked that the role of groups in geometry is so important the year could simply have been given the title "Geometry"). The year, so far, has several components:

1) A short programme during the summer of 2001, on groups and low dimensional topology, organized by S. Boyer (UQAM), and D. Wise (McGill).
2) A short programme in the fall, run by N. Kamran (McGill) and B. Khesin (Toronto), on infinite dimensional groups.
3) A semester (winter-spring 2002), organized by B. Broer (Montreal), J. Carrell (UBC), W. Casselman (UBC), and F. Knop (Rutgers), on the general theme of algebraic groups and algebraic geometry.

A detailed list of activities will be published during the fall. In the meantime, however, we are inviting applications for **post-doctoral fellowships** at the CRM for the year.

On the industrial side of things, the past summer saw the MITACS network hold its first annual general meeting. MITACS (Mathematics of Information Technology and Complex Systems) is a federally funded network of centres of excellence in industrial mathematics, organized as a joint effort of the three Canadian research institutes in mathematical sciences. The meeting was a great success, above all for the important attendance of all the graduate students taking part in the network. Walking through the poster session and seeing all the students talking excitedly about their work gave me great confidence in the future of our discipline in Canada. Next year's meeting is being held in Montreal, and I am sure that I speak for my colleagues at Fields and PIms in extending a general invitation.

The year 2000 is of course the World Mathematical Year. Our efforts at the CRM have concentrated mostly on bringing mathematics to the public, and have been, I think, very successful, thanks mostly to the extraordinary efforts of Stéphane Durand. He put together a beautiful 36 page supplement on mathematics for Québec Science, the local science magazine, with interviews and articles covering such topics as applications of fractals, cardiac rhythms, imaging, machine learning and many others. We plan to do a translation of the supplement into English for a wider audience. Stéphane was also the designer of a beautiful series of posters which won the European Mathematical Society's design contest, and which appeared for a few months in Montreal's subway, as part of a publicity campaign ably organized by Christiane Rousseau. I would like to express my gratitude to both Stéphane and Christiane for their work.

This edition of the Bulletin, as well as containing the usual announcements about programs, books, and news, has an interview with Blaine Lawson which I am sure will be of interest to many readers. Blaine was Aisenstadt lecturer at the CRM during the year 1994-95, and the interview dates from then. For a variety of reasons, all of them our fault, it has not appeared until now. I think it has been worth the wait!

Jacques Hurtubise
Director, Centre de recherches mathématiques

BIOMATHÉMATIQUES: LE GÉNOME HUMAIN N'EST QU'UN DÉBUT

Par Jacques Bélair

On dit que le vingtième siècle a été l'âge d'or de la physique mathématique. Suite à la décennie du cerveau, on pourra it assister au siècle de la biologie mathématique tant la biologie semble la prochaine science dont les fondements seront significativement affectés par une grande mathématisation.

L'effort le plus connu dans ce sens est la cartographie du génome humain: maintenant que sa suite en a été établie, le travail d'arrimage de cette imposante banque de données au fonctionnement de la réplication demeure entier. Pour employer une métaphore macroscopique, l'anatomie semble bien en place, mais la physiologie reste à établir.

On relira avec intérêt le commentaire de Marc Kac dans, *A Mathematician looks at Medicine, Am. J. Medicine 66 (1979) 725,* pour mesurer les changements survenus en biologie mathématique durant les deux dernières décennies: on possède maintenant des modèles numériques tridimensionnels réalistes du coeur (bien que la simulation d'un seul battement cardiaque demande quelques heures de temps machine sur un super-ordinateur). Mais encore aujourd'hui, «la plupart des travaux regroupés sous le vocable de *Biologie Mathématique* sont d'une nature proche des préoccupations des Pionniers de la Physiologie».

La scène scientifique regorge maintenant d'exemples de cette organisation de plus en plus quantitative et mathématique de la biologie. Une des plus importantes société de mathématiques appliquées au monde, SIAM, a récemment accrédité un groupe d'intérêt en sciences de la vie, reflétant les retombées significatives en biologie, des activités mathématiques de ses membres. Certains organismes subventionnaires se rendent compte qu'on ne pourra se contenter de données moléculaires pour comprendre les mécanismes organisationnels et fonctionnels fondamentaux du vivant. C'est ainsi que le *National Institute of General Medical Sciences* (NIGMS) - un des NIH américain de Bethesda, a récemment annoncé une initiative en biocomplexité pour briser les barrières institutionnelles entre biologistes et mathématiciens, et supporter des travaux de modélisation de systèmes complexes caractérisés par des interactions à plusieurs niveaux d'organisation dans les réseaux. Des efforts similaires ont aussi été entrepris, de manière plus ciblée, tant dans le domaine privé que dans le domaine public. Ainsi, une firme califor-nienne de logiciel, *Entelos*, a mis en marché des «organes virtuels», progiciels de simulation d'interventions pharmaceutique et pour corriger des pathologies comme l'asthme ou l'obésité. Le projet

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Dr. Gordon Semenoff honored by the 2000 CAP-CRM Prize in Theoretical and Mathematical Physics

A theoretical physicist who has made contributions to quantum field theory, statistical mechanics and string theory, Dr. Gordon Semenoff's best known work is the first use of index theorems to compute the quantum numbers of topological solitons in field theory. He published this work in 1982 and 1983 and an authoritative review of the subject in 1984.

Dr. Semenoff is also an authority on quantum field theory in unusual environments such as high temperature and density. The theoretical physicist has made many subsequent contributions to theoretical and mathematical physics. He has done well known work on the field theoretical realization of particles with exotic spin and statistics called anyons. He also obtained one of the first solutions of the unitary matrix model in a background field. He discovered an important extra-local gauge symmetry in the Kazakov-Migdal model which is a lattice gauge theory of induced quantum chromo-dynamics. He obtained an exact solution of a variety of matrix models that resemble Coulomb gas models of quarks. Dr. Semenoff attended the University of Alberta where he received his B.Sc. with first class honors in Physics 1976 and Ph.D. in theoretical physics. After a Postdoctoral Fellowship at MIT, he joined the faculty of the University of British Columbia where he has been Professor of Physics since. He was a member of the Institute for Advanced Study in Princeton in years 1985 and 2000 and a Visiting Professor at the Niels Bohr Institute in Copenhagen in 1999. Dr. Semenoff has received a number of honors including a Killam Research Prize (1989), the MacDowell Medal for Achievement in Physics (1991) and the National Bank of Denmark Award (1999).

Un doctorat honoris causa pour Robert Moody

Professeur à l'Université de l'Alberta, Robert Vaughan Moody arrive au Canada de la Grande-Bretagne alors qu'il est encore très jeune.

En 1966, il reçoit son doctorat de l'Université de Toronto et se distinguera par la suite comme mathématicien grâce à la découverte d'une classe d'algèbres de dimension infinie nommée les algèbres de *Kac-Moody*. Son travail exceptionnel lui mérite d'ailleurs des honneurs conjoints avec V. G. Kac, soit la *Médaille Eugene Wigner*. En 1978 et en 1995, *La Société mathématique du Canada* l'honorera, d'une part en lui offrant de livrer la conférence inaugurale Coxeter-James, un privilège qui revient aux mathématiciens qui se distinguent, d'autres parts, d'être conférencier lors de la remise du Prix Jeffery-Williams à l'occasion du 50ième anniversaire de La Société mathématique du Canada. Régulièrement invité au Centre de recherches mathématiques, il y séjournait pendant un an en 1980, l'année même où il est élu à la Société Royale du Canada. En 1998, Robert Moody devient lauréat du Prix CRM/Fields Institute pour son travail exceptionnel sur l'ordre apériodique. En septembre 1999, il donne une conférence remarquée au Fields Institute sur l'ordre apériodique et les quasicrystaux. Finalement, le 26 mai 2000, l'Université de Montréal lui attribue un doctorat honoris causa pour sa contribution exceptionnelle aux sciences.

Tibshirani, récipiendaire du Prix CRM-SSC

Cette année, le Centre de recherches mathématiques (CRM) et la Société statistique du Canada (SSC) ont décerné le Prix de statistique CRM-SSC à M. Robert Tibshirani de l'Université de Stanford.

Ce prix conjoint souligne la contribution exceptionnelle du lauréat aux sciences statistiques pendant les 15 premières années suivant l'obtention de son doctorat. M. Tibshirani a grandi à Niagara Falls et il a étudié aux universités de Waterloo, de Toronto et à l'Université Stanford. Il est un expert de renommée mondiale dans l'élaboration de méthodologies et d'analyses de données faisant appel à une utilisation intensive de l'ordinateur pour des applications dans les domaines de la génétique, de la médecine et de la santé publique. Il est particulièrement reconnu pour ses livres sur les modèles linéaires généralisés et le bootstrap. Après avoir passé 13 ans à enseigner à l'Université de Toronto, M. Tibshirani a récemment été engagé par le département de statistique et de politique relatives à la santé publique de l'Université Stanford.

Michael Sigal receives CRM-Fields Institute 2000 Prize

One of the outstanding mathematical physicists active in Canada today, Professor Israel Michael Sigal, receives the CRM-Fields Institute 2000 Prize. Russian born, he obtained his bachelor's degree at Gorky University in 1968 and later in life, his Ph. D. at Tel-Aviv University (1976). He is currently Professor at the University of Toronto.

Apart from being a worldwide leader in his area of quantum theory, he is the leading expert on the analysis of the Schroedinger equation, which is at the heart of mathematical models of atoms and molecules. He also made groundbreaking contributions to the theory of interaction between light and matter, known as Quantum Electrodynamics. He has been rewarded with many honors. He is a Fellow of the Royal Society of Canada and received, in 1993, the John L. Synge Award for being an outstanding Canadian mathematician. These honors include several invited lectures at the International Congress of Mathematical Physics and the International Congress of Mathematics, and editorship of the following journals: *Reviews in Mathematical Physics* and *Duke Mathematical Journal*. He will receive his Prize November 10 in Montréal.

Le Prix Aisenstadt 1999 remis à Changfeng Gui

C'est avec grand plaisir que le CRM annonce la remise du Prix de mathématiques André-Aisenstadt de l'année 1999 à Changfeng Gui de l'Université de Colombie-Britannique et de l'Université du Connecticut. Monsieur Gui a fait ses études de premier cycle à l'Université de Pékin et a obtenu son doctorat de l'University of Minnesota en 1991. De 1993 à 1995, il fait ses études postdoctorales à MacMaster et devient professeur adjoint à l'Université de Colombie-Britannique en 1997. Il s'intéresse aux propriétés qualitatives des solutions aux équations différentielles partielles non-linéaires comme l'existence, les multiplicités, la symétrie et la stabilité.

A Conversation with Blaine Lawson

reported by Martin Goldstein

H. Blaine Lawson Jr
is Professor of Mathematics
at Stony Brook State University

Following is an abbreviated version of a conversation with Professor Blaine Lawson held during his stay in Montreal as Aisenstadt Chair holder. For his complete remarks see the CRM web site.

I came to mathematics late. I didn't grow up going to math clubs or computing in my bedroom at night or being fascinated by number theory. I began to love it only when I was introduced to analysis and geometry. In high school I always took mathematics for granted. I could do it, but I went to high school in a small town (Norristown, Pennsylvania) where they didn't even have calculus.

> *«Though neither of my parents went to college, my mother felt very strongly that I should go».*

But I loved the world of ideas and, though neither of my parents went to college, my mother felt very strongly that I should go. I was accepted into the engineering program at Brown. Just as I was to begin my freshman year, I looked closely at what I was required to study for four years. The lab and technical engineering courses upset me. There was little time for anything else. So I chose a major in applied mathematics which was still a science degree but allowed substantially more freedom in choice of courses. I found that the program was still too limiting so I ended up getting two degrees, in Russian literature and applied mathematics. Along the way I became interested in physics and ended up also taking some graduate courses in quantum mechanics and quantum field theory and began thinking seriously of doing physics.

To understand basic questions in quantum theory to my satisfaction, I thought I should go to graduate school in mathematics and do something like relativity theory. If I remained interested in physics I could come back to it. I went to graduate school at Stanford hoping to do relativity theory and started to study geometry and topology. I got really interested in geometry and ended up writing my thesis with Bob Osserman on minimal surface theory.

I always thought of mathematics as a basic, beautiful subject but, until I got to graduate school, I found physics more exciting. It had this majestic structure that led to understanding something about the world that we could never see without an intense tradition of analytic thought. It is really amazing, in the period of a few years, to be able to absorb and understand what it took so many people so long to comprehend.And the structure is wonderful. It's almost a modern religion. When physicists talk about physics and when mathematicians think about mathematics, there is a reverence and an awe of the majesty of the subject, its importance, and its central place in our life. Maybe this is true of physics more than mathematics because physics has to do with everything around us, what we are and where we came from.

In my thesis, I found a family of closed minimal surfaces in the three-dimensional sphere, which was sufficiently rich so that, in particular, you got from it every compact surface topologically, except for the projective plane which was ruled out. In Euclidian space there are no compact minimal surfaces. That's because anything which is minimal has to look saddle-like at every point. However since it is a closed surface, you could envelop it in a sphere and then shrink this enveloping sphere until it touched the surface. That point of contact would have to be a point of positive curvature, a spherical point as opposed to a hyperbolic point.This is proved conventionally by conformally parametrizing the surface and then invoking the maximum principle for harmonic functions. There are no compact minimal surfaces in Euclidian space unless you give it a boundary but in the three-sphere there are all these beautiful things that close up. It was elementary geometry so it was very accessible, but it required a bit of analysis to show that it works. I had to solve a Plateau problem and worry about boundary regularity and prove a new reflection principle, things like that. But I always enjoyed the geometry.

I had also read a paper of Jim Simons and I had done some work generalizing it. That was what drew me into this area. I was standing at tea one day at Stanford where Chern had come to give a colloquium and I overheard him talking about his recent work with Da Carmo and Kobayashi. To my horror he started stating theorems in my thesis, so I came over and said, «um... gee... .» He was incredibly gracious about it. Not only did he give me equal credit for the things that I did, but he gave me a job at Berkeley. I went there initially for a couple of years, got promoted and stayed for quite some time. I really loved Berkeley. There was an immense amount of geometry there.

My experiences with students in those first few years in Berkeley were interesting. At the beginning of my second year as an instructor, I went to a reception for new graduate students and met this young fellow from China, who was interested in partial differential equations and was a very nice guy. I was teaching a course in Riemannian geometry at the time and he took it. As the course went on, he would come in and talk to me about this and that. He was full of wonderful ideas and by the time the year was over he had written his thesis and we had written a paper together. That was S.T. Yau and his career is well-known.

> *«It is really amazing, in the period of a few years, to be able to absorb and understand what it took so many people so long to comprehend.»*

Then I went away for a bit and, when I came back, I ran into another Berkeley graduate student whom I had known mostly through political activity. This was during the Vietnam war and a lot of us were active in trying to change things. The student was Bill Thurston and he asked, «What are you doing?» I said «I've gotten interested in foliations.» I had produced some codimension-one foliations of spheres, which people had tried to do for some time. He said «Oh, that's interest-

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SCIENTIFIC AGENDA
YEAR 2000-2001

MATHEMATICAL
METHODS IN
BIOLOGY AND MEDECINE

The year 2000-2001 at the CRM will be devoted to the rapidly developing field of mathematical methods in biology and medicine. The application of mathematics contributes to the understanding of natural processes both though mathematical models and their analysis, and through the development and application of mathematical methods and inference. The year emphasizes both aspects, with workshops covering various applications of nonlinear dynamics in biology and medicine, as well as genomics, and medical imaging.

AISENSTADT CHAIR LECTURE SERIES

8 septembre 2000
Arthur T. Winfree (Arizona)
Vortices in Motionless Media
14 septembre 2000
Unsolved Problems of the Heart.
15 septembre 2000
Linked and Knotted Vortex Rings in Excitable Media.
20 septembre 2000
Some Challenging Puzzles Suggested by Vortices in Excitable Media.
21 septembre 2000
Phase Patterns in Biological and Chemical Oscillators.

March 2001
Michael S. Waterman (USC)
Mathematics for Reading and Understanding Genetic Sequences.

May 22 - June 2, 2000 - Summer School

Nonlinear Dynamics in Biology and Medicine/Dynamique nonlinéaire en biologie et en médecine

Offered jointly with the *Centre for Nonlinear Dynamics in Physiology and Medicine*, this is an intensive introduction to the applications of nonlinear dynamics to biology and medicine, with computer exercices and an introduction to numerical techniques.
Organizer : Jacques Bélair (Montréal

INTERNATIONAL ANNUAL MEETINGS

June 21-23, 2000

Combinatorial Pattern Matching/ Agencement combinatoire (CPM 2000)

This meeting has a major computational biology component and includes fields which share a common focus on the formulation, algorithmic recognition, analysis, communication and storage of patterns in diverse kinds of data. **Organizers :** Raffaele Giancarlo (University of Palermo), David Sankoff (Montréal)

April 21-24, 2001

Fifth Annual International Conference on Computational Molecular Biology/Cin-quième conférence annuelle de biologie moléculaire computationnelle (RECOMB 01)

The premier annual meeting in computational molecular biology, featuring a highly competitive selection of the best research papers from cutting edge projects for presentation, its subject is computational and mathematical in nature. **Organizer :** David Sankoff (Montréal)

May 17, 2000

Workshop on Bioinformatics/Bioinformatique

A workshop on diverse problem areas in bioinformatics, in the context of the annual meeting of the *Association canadienne-française pour l'avancement des sciences* (ACFAS).
Organizer : Nadia El-Mabrouk (Montréal).

WORKSHOPS

May 18-19, 2000

Workshop on Novel Approaches in RNA Informatics (NARI)/Approches nouvelles en informatique de l'ARN (ANIA)

The goal of this symposium is to explore the current state of the art in RNA informatics and to look towards the future of the field. The NARI symposium will provide a general forum for disseminating the latest developments, and will bring together scientists from biochemistry, molecular biology, computer science, mathematics and statistics who will present an overview of novel approaches.
Organizer : François Major (Montréal)

September 9-13, 2000

Workshop on Molecular, Metabolic, and Gene Control Networks/Réseaux moléculaires, métaboliques et de contrôle génétique

Modeling in this field has recently involved topics including regulation of progression through the cell cycle as mediated by check points, control in the lactose and tryptophan operons, and the integrated behaviour of large coupled molecular/metabolic/gene networks. This workshop brings together both experimentalists and modelers to examine the current state of the field and exciting future prospects.
Organizer : Michael C. Mackey (McGill)

September 22-25, 2000

Workshop on Gene Order Dynamics, Comparative Mapping and Multigene Families/ Dynamique de l'ordre génique, cartographie comparative et familles multigéniques (DCAF)

This meeting will bring together scholars in the biological and mathematical sciences working on genome rearrangement, mapping and the evolution of gene families in human, animal, plant, other eukaryote, prokaryote, organellar and viral genomes.
Organizers : David Sankoff (Montréal) and Joseph H. Nadeau (Case Western Reserve University)

October 3-6, 2000

Workshop on Nonlinear Dynamics and Biomathematics/Dynamique nonlinéaire et biomathématiques

The state of the art in the application of techniques from nonlinear dynamics to diverse fields of biology (biochemistry, physiology, resources management, medical imaging) will be covered. This workshop is part of the *Entretiens du Centre Jacques-Cartier*. **Organizers :** Pierre Auger (Lyon), Jacques Bélair (Montréal), Jacques Demongeot (Grenoble) and Christiane Rousseau (Montréal)

October 12-15, 2000

Workshop on Memory, Delays and Multistability/ Mémoire, retards et multistabilité

This workshop will focus on important current issues in the modeling of neural activity in recurrent circuitry, such as recurrent activity thought to lie at the core of sensory information processing. The emphasis will be on the mathematical issues which arise in the modeling of such activity in real biological systems. **Organizer :** André Longtin (Ottawa)

October 29-November 1, 2000

Workshop on Mapping and Control of Complex Arrhythmias/Cartographie et contrôle des arythmies complexes

This workshop will cover recent advances in computational and analytical techniques and power which have opened new avenues for understanding and interventine in the prevention of cardiac arrhythmias. Organizer : Leon Glass (McGill)

November 11-14, 2000

Workshop on Fractal and Modeling in Structural and Dynamical Analysis/Fractales et modélisation en analyse structurelle et dynamique

Classical problems in material sciences (surface characterization, description of branching networks) have been given new impetus by the introduction of fractal concepts. This workshop will cover the latest theoretical developments, their contributions in the biomedical field and future directions of investigations.
Organizers : Jacques Bélair (Montréal) and Fahima Nekka (Montréal)

December 10-11, 2000

Workshop on Mathematical Methods in Brain Mapping/Méthodes mathématiques en cartographie cérébrale

Brain mapping is a rapidly growing research field that tries to understand human brain function and anatomy using 3D images from MRI, fMRI, PET, EEG and MEG using geometry, topology, statistics and random fields. This workshop is intended to bring together mathematicians and statisticians interested in brain mapping, and medical researchers interested in mathematical and statistical methods for the analysis of brain mapping data. **Organizer:** Keith Worsley (McGill)

February 26 - March

Worshop on Fractals and Wavelets in medical Imaging/Fracatales et ondelettes en imagerie médicale

Organizer: Jean-Marc Lina

March 8-11, 2001

Workshop on Population Genetics at the Molecular Level/Génétique de population au niveau moléculaire

The genes and alleles of classical genetics are abstract notions. Now that these are increasingly understood in terms of particular sequence of DNA and protein, the mathematical foundations of the field must be revisited and expanded, which is the object of this workshop.

Organizer: Brian Golding (McMaster)

April 25-26, 2001

Workshop on Mathematical Formalisms for RNA Structure/Formalismes mathématiques de la structure d'ARN

This symposium will explore the current state of the art in computational RNA structure, and provide a look towards the future of the field.

Organizer : François Major (Montréal)

COURSES AND SEMINARS

June 19-20, 2000

Combinatorial Pattern Matching/Agencement combinatoire

Organizer : David Sankoff (Montréal)

June 26-July 1, 2000

Developing the Tools: A Canadian Bioinformatics Workshop/Développer les outils: un atelier de bioinformatique canadienne

One of a series of training workshops piloted by the Canadian Genetic Diseases Network and the Biotechnology Human Resources Council. **Organizers:** Christopher Hogue (Toronto), François Major (Montréal)

December 5-8, 2000

Techniques in Brain Mapping/Techniques de cartographie cérébrale

In preparation for the workshop on brain mapping, four series of introductory lectures will be given, covering the geometry of random field, methods in functional magnetic resonance imaging and methods for EEG analysis. **Organizers :** Keith Worsley (McGill), Bernard Goulard (Montréal)

April 18-20, 2001

Showcase for Competing Technologies for Phylogenetics/Vitrine pour les technologies phylogénétiques (SCOPH)

This seminar is addressed to researchers, teachers and students interested in current developments in phylogenetic analysis. The speakers will each address one or two major areas and there will be ample time for comparison, debate and discussion. Some of the themes will be: efficient methods for very large phylogenies, model-based versus model-free approaches, tree inference with and without ancestor reconstruction, generalizations of trees. Software packages will be available on-line and there will be facilities for demonstrations and hands-on experimentation. **Organizers:** David Bryant (Montréal), David Sankoff (Montréal)

AUTRES ACTIVITÉS

20-21 octobre 2000

Conférence en l'honneur d'Adrien Douady

Une conférence se déroulera au CRM les 20, 21 octobre pour célébrer le 65ième anniversaire de naissance d'Adrien Douady. **Participants**: B. Branner, R. Bott, J. Hubbard, T. Lei, M. Loday, M. Lyubich, B. Mazur, J. Milnor, R. Narasimhan, D. Schlomiuk, J.-C. Yoccoz.

29-30 septembre 2000

XIIe Rencontre de théorie des représentations des algèbres/XIIth Meeting on the Representation Theory of Algebras (Université de Sherbrooke)

Organisateur: Ibrahim Assem

7 au 10 septembre 2000

Combinatoire, Informatique et Applications

Les disciplines couvertes par le LaCIM ont connu des développements remarquables au cours des dix dernières années, que ce soit sur le plan théorique, en combinatoire énumérative ou algébrique, ou au niveau des applications, en analyse classique, en calcul formel, en géométrie algorithmique, en chimie combinatoire, en physique statistique, et, plus récemment, en bio-informatique. **Organisateurs:** Pierre Leroux, Robert Bédard, Srecko Brlek, Manon Blais.

March 26 - April 27, 2001

Symplectic and Contact Topology, Quantum Cohomology, Symplectic Field Theory and Higher-Dimensional Gauge Theory/Topologie symplectique et de contact, cohomologie quantique, théorie des champs symplectique et théories de jauge.

Discussion on the recent developments in the construction and computations of invariants of symplectic and contact manifolds and their automorphism groups, using methods of the theory of J-holomorphic curves, as well as thjose from gauge theory and dynamical Hamiltonian systems. Organizers: S. Donaldson, B. Dubrovin, Ya. Eliasberg, A. Givental, H. Hofer, B. Khesin et G. Lalonde.

(Bélair, suite de la page 1)

Physiome de l'University of Washington tente de développer un environnement de modélisation au niveau des organes, alors que le Consortium *Physionet* du «Research Resource for Complex Physiological Signals» vise la mise en commun des techniques d'analyse de séries chronologiques issues de systèmes physiologiques, par la mise sur pied d'un répositoire de telles séries.

Les activités de l'année thématique 2000-2001 du CRM consacrée aux Méthodes Mathématiques en Biologie et en Médecine s'insèrent donc naturellement et pertinemment dans cette problématique assurément conjoncturelle, et sans nul doute également structurante. Le programme, présenté en détail sur le site www.crm.umontreal.ca/biomath, offre un vaste éventail de méthodes mathématiques d'analyse et de traitement de nombreux systèmes biologiques, et peut se regrouper, grosso modo, sous les deux thèmes *Dynamique Nonlinéaire* et *Bioinformatique*.

Dans ce dernier cas, certaines des conférences les plus importantes du domaine feront partie des activités thématiques. Par exemple, *Agencement Combinatoire* (CPM 2000) tenue en juin dernier a été un vif succès, et on s'attend à une participation toute aussi nombreuse et enthousiaste pour RECOMB01, la *5e Conférence Internationale annuelle de biologie moléculaire computationnelle*.

Pour le domaine précédent, l'École d'été tenue en juin, conjointement avec *Le Centre de dynamique nonlinéaire en physiologie et en médecin*e, s'est avérée un triomphe auprès des étudiants participants, qui ont été exposés à un vaste éventail de techniques de modélisation en physiologie. Plusieurs ateliers sont prévus, surtout à l'automne, sur des sujets tels que *Réseaux moléculaires, métaboliques et de contrôle génétique* (septembre), *Mémoire, retards et multistabilité* (octobre), *Cartographie et contrôle des arythmies cardiaques* (octobre) et *Fractales et modélisation en analyse structurelle et dynamique* (novembre). L'imagerie médicale et la cartographie cérébrale seront également abordés dans des ateliers dédiés.

Il y aura deux titulaires de la Chaire Aisenstadt: Arthur Winfree présentera sa vision des *Tourbillons dans les milieux inertes* en septembre, alors que Michael Waterman discutera des mathématiques pour lire et comprendre le code génétique.

ing. I've been working on foliations in my
(from page 3)
thesis». I said, «Oh, I had no idea we had common mathematical interests.» So I told him about a meeting I had just been to where an invariant had been presented by Claude Godbillon. He had shown that if you had a two-dimensional foliation of a three-manifold, then there was a natural construction of a three-dimensional cohomology class that one could make from the algebra of the foliation, using the fact that the distribution was integrable. It was a beautiful, straightforward construction. But he said he didn't know at the time whether this invariant was non-zero or not.

So I said to Bill, «I should show it to you because it's so simple and nice». I explained it to him and the next day he knocked at my door and said, «It's non-zero.» The following day he knocked on my door and said, «And it can take any real value.» It was very exciting and we ended up talking a lot about foliations. The following year, Bill went to the Institute (for Advanced Study at Princeton). He had sent this example to Jack Milnor and Jack wrote back asking him to be his assistant. I was going to the Institute anyway so we spent the whole year together. That was 1973-74. It was a wonderful period.

> *«Without question the thing which has most enriched my mathematical life has been my collaborations.»*

Haefliger was also there and a number of other people interested in foliations. However, for the most part it amounted to Haefliger and the rest of us sitting back and watching Bill produce an astonishing array of theorems that no one ever dreamed could be true. It was amazing. Bill took parts of the subject from zero to infinity in less than two years. He changed the landscape of the field so much that many people began to turn away and work in other areas. It was that difficult to keep up. I don't know if that was the real reason for their leaving but it certainly happened in fact. My interest also changed but that was because I was attracted to another area. I started working with Reese Harvey on a problem in several complex variables. My turning away from foliations was more a turning toward something else. But it was convenient because by the time Bill was done with the subject, many of the problems that interested me were

I stayed in Berkeley until l978 when I moved to Stony Brook. Stony Brook also had a wonderful group of geometers. Jeff Cheeger, Detlef Gromoll and Misha Gromov were there, as well as Tony Phillips, Lowell Jones and many others. Jack Milnor was visiting at the time and Marie-Louise Michelsohn and Dusa McDuff came that same year. It was then that Gromov and I started talking about scalar curvature questions. Again this came out of minimal surfaces because the original proofs of the non-existence of metrics of positive scalar curvature, due to Schoen and Yau, used minimal surface techniques. This interested me, so I gave a few talks on their work, and Gromov and I started collaborating. We found different ways of doing things and proved theorems that were not accessible by their techniques. This led to a long series of papers. Working with Gromov has been one of the really exciting experiences of my life. He is now at IHES near Paris, but we have kept up our mathematical relationship.

> *«We found different ways of doing things and proved theorems that were not accessible by their techniques.»*

Without question the thing which has most enriched my mathematical life has been my collaborations. I have had many. One of the most important has been with Marie-Louise Michelsohn. We have worked together on a wide variety of topics and we wrote a book together on Spin Geometry. In recent years I have also been working closely also with Eric Friedlander from whom I have learned a great deal of mathematics.

I have always taught and enjoyed it. When I was at Berkeley, I was involved with Uri Treisman in training teachers and teaching-assistants. I like students. I like interaction. I should say that one of the reasons I love mathematics is because of the people in it. For me when I look back over a lifetime in mathematics, I can truly say that what has made it rich for me has been the people that I have come to know and the excitement of being able to interact with some of the most interesting and profound minds in the world. It's a tremendous high and I find a similar pleasure with students. To get students interested in something and to say something that catches their imagination and lights up their eyes is a wonderful experience. I have had some twenty graduate students finish Ph.D.'s. I have from three to five at a time and produce about one Ph.D. a year.

been very important to me. I played the harpsichord for a while and I have started to play the piano again. As a child I studied piano. Just after graduate school, I bought a harpsichord and began to play the old literature. I started doing sonatas, trios and things with other people, which I really enjoyed. Recently, I returned to the piano. The humidity where I live was making the harpsichord almost impossible to play. It was always incredibly out of tune. Spending a half-hour tuning every time I wanted to play began to put me off, so I returned to the piano. It is a source of great relaxation.

started running. When I was in college, I rowed crew and I liked it a lot. This past year, my alma mater Brown won every possible trophy in crew. (They have gotten much better since my day.) I still have a scull which I take out from time to time. I love the water in general, swimming and boating. It's one of the nice things about living on Long Island.

> *«For me when I look back over a lifetime in mathematics, I can truly say that what has made it rich for me has been the people that I have come to know and the excitement of being able to interact with some of the most interesting and profound minds in the world.»*

The other thing I like about mathematics, which goes hand in glove with the people, is the travel. I've been to France often. I've also spent time in Brazil. Shortly after I got my degree, I was there for six months at IMPA (Instituto de Matematica Pura e Applicada, in Rio de Janeiro). I learned some Portugese and I really loved both the country and the atmosphere at IMPA. It was very open. Then I visited Kyoto, Japan and the Tata Research Institute in India. I like to spend long periods in places so I can begin to know them. I've been to Canada a number of times. I was here in Montreal over twenty years ago. There is a nearly out-of-print set of notes for a course I gave here still circulating. I really like Montréal. I haven't been back for the past twenty years although I've been to Canadian Mathematical Society meetings in Halifax and in Newfoundland.

NOUVELLES BRÈVES

Franc succès pour la promotion des maths

Stéphane Durand a remporté cette année le premier prix de *La Société mathématique européenne* pour ses sept ingénieuses affiches parues dans le métro de Montréal en janvier 2000, soulignant l'Année mondiale des mathématiques. Le concours d'affiches visait à transmettre un message mathématique de façon attrayante. Il est possible de voir les affiches sur le site www.crm.umontreal.ca/math2000.

Entrée en fonction de Christian Léger

Christian Léger, professeur titulaire du département de mathématiques, succède à Stephen Boyer en tant que directeur-adjoint scientifique au CRM. Son mandat de 6 mois a commencé en juillet et se termine en décembre 2000. Niky Kamran, professeur au Department of Mathematics and Statistics de l'Université McGill, entrera en fonction en janvier 2001. Jacques Bélair, Stephen Boyer, Christian Léger et Niky Kamran ont accepté d'assurer une rotation à la direction du CRM.

La Société Royale pour Jerry Lawless

Le 13 juillet dernier, Jerry Lawless, membre du Comité Aviseur du CRM et professeur au Department of Statistics and Actuarial Science de l'University of Waterloo, a été élu Membre de la Société Royale du Canada en reconnaissance de ses contributions majeures à la théorie et à la pratique des statistiques. Jerry Lawless sera accueilli par la Société Royale du Canada lors d'une cérémonie qui aura lieu à Ottawa le 17 novembre 2000. Nos félicitations pour cette haute distinction!

Martin Goldstein quitte le CRM

Après douze ans de valeureux services auprès du CRM à titre de directeur-adjoint, Martin Goldstein tire sa révérence à ce poste pour se consacrer à l'enseignement et à la recherche à temps plein. Jean LeTourneux assume désormais les fonctions de directeur-adjoint aux publications.

NOS CHERCHEURS DANS LES MÉDIAS

À l'occasion de l'Année mondiale des mathématiques, nos chercheurs se sont particulièrement distingués dans les médias. Voici en revue, leurs principales contributions.

Collaborations au Canal Z

Au printemps 2000, le Canal Z a mis sur pied la série, *C'est mathématique*. Concept du physicien Stéphane Durand, la maison de production Téléfiction a fait appel à plusieurs chercheurs du CRM pour collaborer. Ainsi Stéphane Durand a participé à deux émissions: l'une sur l'application des mathématiques dans le monde animal et végétal, l'autre, sur la célèbre théorie énigmatique d'Einstein. Le mathématicien Yvan St-Aubin a expliqué les symétries en jeu dans les constructions hyper-complexes du dessinateur néerlandais M.C. Escher (1898-1972). Jean-Marc Lina a abordé la santé en explorant la compréhension des mesures fonctionnelles du cerveau par la cartographie du cerveau. Quant à Jacques Bélair, il a partagé ses connaissances des fractales.

Les mathématiques dans Forum

Dans le numéro du 17 janvier 2000 de *Forum*, l'article *Les Mathématiques dans le métro* signé Mathieu-Robert Sauvé, fait état de la campagne de promotion des mathématiques dans les métros menée par Christiane Rousseau et, de la contribution de Stéphane Durand comme vulgarisateur scientifique (voir www.forum.umontreal. ca/numeros/1999-2000/Forum-00-01-17/article01.html). En mai, le même auteur souligne le supplément de 36 pages de Québec Science et fait le tour des retombées médiatiques suite à la campagne de promotion. (voir www.forum.umontreal.ca/numeros/1999-2000/Forum-00-05-17/article09.html)

University Affairs et Interface ciblent Nadia El-Mabrouk

En mars 2000, le journaliste Tim Lougheed de *University Affairs*, profite de la volonté de l'Institut canadien des recherches avancées (ICRA) de créer des emplois visant à freiner l'exode des cerveaux pour cibler le talent d'un chercheur du CRM, la bio-informaticienne Nadia El-Mabrouk sous le titre *L'élite de la recherche*. Madame El-Mabrouk faisait d'ailleurs l'objet d'un généreux portrait de Mathieu-Robert Sauvé dans la revue *Interface* de Septembre-Octobre 2000.

Une incursion dans les grands médias

Le 15 avril, Pierre Foglia de *La Presse*, impressionné par les constructions bio-mathématiques apparaissant sur les affiches dans le métro fait des mathématiques le sujet d'un de ses articles qu'il titre *Dieu, les guépards et les ananas*.

Le 8 mai, *Le Devoir* publie une entrevue de Paule des Rivières avec Jacques Hurtubise, le directeur du RCM2 et du CRM. L'article *Plaidoyer pour les chercheurs* est suivi d'un court profil de carrière de Monsieur Hurtubise sous le titre *La grande aventure mathématique*. (À lire sur www.ledevoir.com/edu/2000b/hurt080500.html.)

En mai, le mensuel Québec Science fait sien le projet d'inclure, sous la direction de Stéphane Durand, un supplément tiré à 40,000 exemplaires. Intitulé *Fascinantes et universelles, les mathématiques au quotidien/Math2000*, le supplément rassemble les textes d'une quinzaine de spécialistes en maths et en sciences dont nos chercheurs Christiane Rousseau, Michel Delfour, Yoshua Bengio, Jean-Marc Lina, Fahima Nekka, François Soumis et Henri Darmon.

Puis, en août dernier, le professeur Bernard Goulard répond à des questions de la journaliste Brigitte Bougie à RDI concernant le sous-marin russe englouti, le Koursk. Monsieur Goulard avait aiguisé ses connaissances des sous-marins nucléaires en travaillant à un projet au M.I.T. il y a 8 ans. Le 5 novembre 2000, *Découverte*, l'émission de vulgarisation des sciences qu'anime Pierre Tisseyre à Radio-Canada, nous présentera à nouveau Bernard Goulard ainsi que Jean LeTourneux qui discutent des mathématiques.

In Memoriam

Lucien Le Cam (1924-1999)

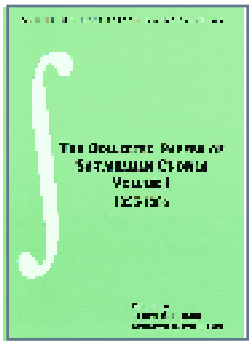
Le 25 avril 1999, le professeur émérite Lucien Le Cam décédait de causes naturelles. Il laisse dans le deuil son épouse, ainsi que trois enfants, Denis, Steven et sa fille Linda qui, à cause d'un cancer qu'elle contractait très jeune, l'a incité à participer à des recherches sur le cancer. Directeur du Centre de recherches mathématiques de 1971 à 1973, «Lucien Le Cam a marqué le CRM», rapporte celui qui l'a suivi à la tâche, le professeur Anatole Joffe. Né le 18 novembre 1924 en France, son père fermier la laisse dans le deuil une femme et trois enfants alors que Lucien n'a que 13 ans. Plus tard, Le Cam passe à l'emploi d'Électricité de France en tant que statisticien. En 1950, il débarque à New York. Puis, en 1952, il obtient son doctorat de Berkeley et il épouse Louise Romig, fille de statisticien. Professeur à Berkeley, il se spécialise dans les statistiques mathématiques. Il a enrichi la communauté scientifique de ses recherches, de son intégrité et de son intelligence. Auteur de *Asymptotic Methods in Statistical Decision Theory* et un des co-auteurs d'*Asymptotics in Statistics: Some Basic Concepts*, il est membre de l'*American Academy of Arts and Sciences*.

THE COLLECTED PAPERS OF SARVADAMAN CHOWLA

edited by James G. Huard (Canisius College) and Kenneth S. Williams (Carleton University)

Published by the Centre de recherches mathématiques

Sarvadaman Chowla (1907-1995) was an extremely talented mathematician who earned an international reputation for his research in number theory and related areas. Several important theorems (the Bruck-Chowla-Ryser theorem, the Ankeny-Artin-Chowla congruence, the Chowla-Mordell theorem and the Chowla-Selberg formula) are named after him. Chowla wrote over 350 mathematical papers during the period 1926-1986. These papers have been collected together in three volumes. The first volume contains a biography of Chowla by James G. Huard, an overview of Chowla's work by M. Ram Murty, V. Kumar Murty and Kenneth S. Williams, recollections of Chowla by a number of famous mathematicians, copies of letters to Chowla by such mathematicians as G. H. Hardy and A. Weil, several photographs, as well as other material.



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ZUZANA MASAKOVA REÇOIT LE PRIX DU MINISTRE DE L'ÉDUCATION DE LA RÉPUBLIQUE TCHÈQUE

En janvier dernier, la PraÏska Technika publiait un article soulignant l'excellence du travail de Zuzana Masakova, présentement visiteur au CRM. Nous reproduisons ici en partie la teneur de ce texte.

Pour souligner le 10ième anniversaire des événements du 17 novembre 1989 en République Tchèque, le Ministre de l'Éducation, Jeunesse et Sports (République Tchèque) accordait des prix à cinq étudiants gradués pour l'excellence de leurs résultats dans leurs études et leurs recherches: parmi ceux-ci, l'étudiante Zuzana Masakova.

Suite à une collaboration fructueuse développée, depuis 1989, entre les départements de mathématique et physique de la Faculté de Génie Nucléaire et de Physique de l'Ingénieur (FGNPI) de l'Université Polytechnique Tchèque et le Centre de recherches mathématiques (CRM) de l'Université de Montréal, par les professeurs d'origine tchèque, P. Winternitz et J. Patera du CRM et les professeurs M. Havlivcek et J. Tolar du FGNPI, plusieurs des étudiants et collaborateurs de ceux-ci, ont eu la possibilité de se regrouper autour de leur sujet d'intérêt commun,soit la théorie des groupes et l'algèbre de Lie, sous forme de stages scientifiques à Montréal et vice versa. […]

Suite à son séjour au FGNPI en 1993-94 et grâce à ses résultats exceptionnels, Zuzana Masakova s'est donc vu offrir de joindre le travail du séminaire, déjà en cours, sur les quasicrystaux. Pendant ce temps, deux spécialistes dans le domaine des structures apériodiques, J.P. Gazeau de Paris et J. Patera du CRM, ont été invités à la FGNPI à diriger des séminaires sur leur travail. Zuzana Masakova y a apporté une contribution décisive […] Depuis 1997, elle a visité le CRM à huit reprises. Pendant son séjour à l'Université de Montréal, Zuzana Masakova a contribué à plusieurs articles publiés dans des journaux internationaux renommés. […]

Zuzana Masakova a terminé son doctorat au département de mathématiques du FGNPI. Elle a déjà reçu l'offre d'une bourse postdoctorale du Laboratoire Universitaire Bell Canada.

Le prix accordé à Zuzana Masakova confirme les bienfaits que peuvent tirer les étudiants d'une préparation théorique imposée dès la première année d'études au FGNPI. Ce prix permet également aux étudiants de se joindre rapidement à une équipe de recherche scientifique et de connaître le succès.

Traduit et adapté d'un texte du Doc. RNDr. Emil Humhal, CSc., Département de mathématiques FGNPI.

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