

CMS

NOTES

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Volume 33

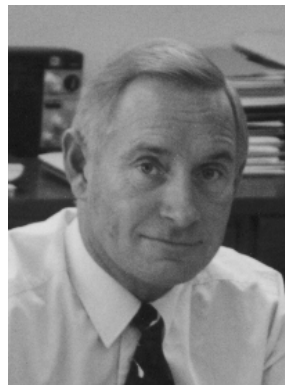
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### FROM THE EXECUTIVE DIRECTOR'S DESK



*Graham Wright*

#### **A Time of Transition**

At the Annual General Meeting in Saskatoon, the Tellers Report for the 2001 Election was accepted unanimously. I would like to thank all of those who stood for election and extend congratulations to those who were elected. Before providing details on the incoming members of the Executive Committee and the Board of Directors I would like to thank those whose terms ended in June 2001.

I would first like to thank Richard Kane (Western) who has just completed four years as President-Elect (1997-1998), President (1998-2000) and Past-President (2000-2001). The Society has benefited greatly from Richard's guidance, counsel, and excellent leadership. Being on the Executive Committee requires a significant commitment from each member, particularly

during a period in which the CMS was reviewing all of its various activities and programs. Considerable thanks are due to Margaret Beattie (Mt. Allison), François Bergeron (UQAM), Thomas Salisbury (York) and Keith Taylor (Saskatchewan) for their support and direction over the past two years. To Jacques Bélair (Montréal), Jason Brown (Dalhousie), Robert Dawson (St. Mary's), François Dubeau (Sherbrooke), Penny Haxell (Waterloo), Jennifer Hyndman (UNBC), Anthony Lau (Alberta), Neal Madras (York), Karen Seyffarth (Calgary), Sylvia Wiegand (Nebraska) and Gail Wolkowicz (McMaster), who have been members of the Board of Directors for the past four years, I also wish to express the Society's sincere thanks.

Effective June 30, 2001, James Mingo (Queen's) stepped down as Chair of the Publications Committee and James Carrell (UBC) and Nasif Ghoussoub (UBC) also ended their terms as Editors-in-Chief of the Canadian Journal of Mathematics. The quality of our publications is very high and the revenue they generate is very important to the financial health of the Society. We are indebted to each of them for their excellent service. The new Chair of the Publications Committee is Keith Taylor (Saskatchewan) and the new Editors-in-Chief of the Journal are Henri Darmon (McGill) and Niky Kamran (McGill). I am also pleased

*(see EXEC—page 10)*

*CMS NOTES*  
*NOTES DE LA SMC*

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**EDITORIAL**



*S. Swaminathan*

At the conclusion of the Dalhousie University-CMS Math Camp last June, each participant was given, among other things, a CD-ROM of MathResource's *Interactive Math Dictionary*. A recipient exclaimed, "Gee, that's neat. Are text-books also available in this form?" No, not yet, although some calculus and linear algebra texts have CD-ROM components attached to them. The CD-ROM format has been found very useful for reference books like encyclopaedias, dictionaries, travel guides, cook books, etc. Libraries have benefited by CD-ROM reference books and children's books. Indeed, they have adapted increasingly to computer-based technology, seeking more and more to switch to electronic resources. Budgets for journals and magazines are stretched to the limit by inflationary increases. Every year we are faced with the problem of deciding which journals to cut. Opting for electronic versions of journals is becoming more popular. Prices of electronic services also increase depending on many factors.

This is a common problem for University departments in the country. Please write to us the creative ways that your department has devised to combat increasing prices of journals and books.

All CMS journals are now available on line. For example, the October issue of these NOTES can be viewed at the site <http://journals.cms.math.ca/Notes/>.

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À la fin du camp de mathématiques de la SMC qui s'est tenu à l'Université Dalhousie en juin dernier, chaque participant a reçu, entre autres, un cédérom intitulé *MathResources* (dictionnaire de mathématiques interactif). «Wow! C'est super! Est-ce qu'il y a aussi des manuels sur cédérom?», demanda un des participants. Pas encore, mais certains manuels de calcul différentiel et intégral et d'algèbre linéaire sont accompagnés d'un cédérom. Les manuels de référence tels les encyclopédies, les dictionnaires, les guides de voyage, les livres de recettes (et j'en passe) se trouvent sur cédérom et ils sont très pratiques. De plus, les cédéroms de référence et ceux pour enfants sont très prisés des bibliothèques, qui sont de plus en plus informatisées et cherchent à s'approprier le plus de ressources électroniques possible. L'inflation grève le budget des revues et des magazines; chaque année, nous devons choisir quelle revue nous retirerons des rayons. La version électronique des revues gagne beaucoup en popularité, mais certains facteurs influencent à la hausse le coût des services électroniques.

Tous les départements des universités du pays sont aux prises avec le même problème. Dites-nous comment votre département s'y est pris pour pallier la hausse des prix des revues et des manuels.

Toutes les revues de la SMC sont maintenant en ligne. Par exemple, vous pouvez lire les NOTES du mois de octobre au <http://journals.cms.math.ca/Notes/>.

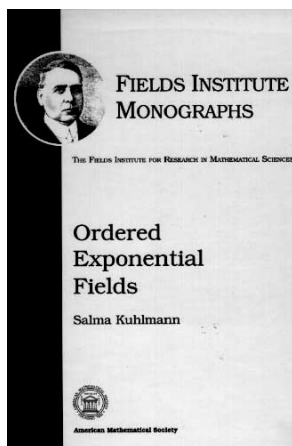
## Ordered Fields Combine Analysis, Algebra and Model Theory

Book Review by Charles Holland, Bowling Green State University

### Ordered Exponential Fields

by Salma Kuhlmann

Fields Institute Monographs 12  
American Mathematical Society  
Providence, 2000  
xviii + 166 pp.



The parts of mathematics that lie in the area of overlap between otherwise distinct subjects are often the most interesting. The book under review is an excellent example of this, bringing together material from analysis involving growth and convergence properties of functions on the reals; from geometrically inspired algebra, involving fields and ordered sets; and from model theory, with its interest in the formal properties of mathematical structures.

The field of real numbers  $\mathbb{R}$ , together with its order structure, forms the primary example of an *ordered field*: the order is preserved by addition and by multiplication by positive elements.

It has been well known for more than 100 years that  $\mathbb{R}$  and its subfields are characterized (among ordered fields) by the *archimedean* property: if  $0 < a < b$ , then there exists an integer  $n$  such that  $b < na$ . But in the initial development of calculus there were implicitly present *infinitesimals* — positive numbers  $a$  so small that  $na < 1$

for all  $n$ . The lack of an axiomatic defense brought these into disrepute, to be replaced in the 19th century by the rigorous, but much more complicated, notion of limits. Then, in the 20th century the infinitesimals were resurrected and put on a firm foundation by logicians, in the development of non-standard analysis. Although the standard approach to calculus now is through limits, any teacher of calculus will be familiar with the beginning student who intuitively believes in infinitesimals.

In non-standard analysis, the existence of non-archimedean ordered fields is important, but their specific structure is not. On the other hand, much has been known about the algebraic structure of ordered fields since Hahn's theorem in 1904. It has long seemed to the reviewer that the known structure could usefully be exploited in the study of non-archimedean models of  $\mathbb{R}$ , and the book under review is a very successful realization of this.

The simplest example of a non-archimedean ordered field is the following. Let  $\mathbb{Z}$  denote the ordered group of integers and  $\mathbb{R}((\mathbb{Z}))$  the field of formal power series of the sort

$$\sum_{i=n}^{\infty} r_i x^i,$$

where  $n$  may be any integer, positive or negative. Then the element  $x$  is infinitesimal. In the more general Hahn construction,  $\mathbb{Z}$  is replaced by an arbitrary ordered abelian group  $G$ , and the elements of the field by those functions  $f : G \rightarrow \mathbb{R}$  whose *support*  $\{g \in G \mid f(g) \neq 0\}$  is a well ordered subset of  $G$ . The Hahn-type theorems, proved in various forms, first by Hahn and then many others over the first half of the 20th century, show that every ordered field is a subfield of  $\mathbb{R}((G))$  for a suitable ordered group  $G$ .

The arithmetic of formal power series fields is straight forward, being

similar to that of polynomials. But these fields do not support extensions of other natural functions on the reals. It is the author's purpose in this book to study ordered fields which have an *exponential* function, that is, an isomorphism from the additive ordered group of the field onto the multiplicative ordered group of its positive elements. It is a highlight of the book to show that although a power series field  $\mathbb{R}((G))$  *never* has such an exponential, a suitable countable union of power series fields does, and by this means the author constructs exponential ordered fields with many interesting properties.

Any ordered field  $K$  has a *rank*,  $G$ , essentially the totally ordered multiplicative abelian group of its archimedean equivalence classes. In the case of a power series  $K = \mathbb{R}((G))$ , the rank is  $G$ . And as an ordered group,  $G$  also has a rank  $\Gamma$  which is the ordered *set* of its archimedean classes. An exponential function  $f$  on  $K$ , if present, also has a similarly defined rank which is an ordered set. Much of the book concerns itself with the interplay of these various ranks, especially the reduction of questions about  $K$  to ones about the simpler structure  $G$ , and thence to ones about the even simpler structure  $\Gamma$ .

The assignment of an element of an ordered field, or of an ordered group, to its archimedean class gives rise to a natural valuation. The methods of valuation theory are useful here, and the author develops and uses the necessary ones. The fact that all ordered fields have characteristic 0 simplifies things somewhat.

There are two entirely equivalent ways to order the product of ordered sets: lexicographically, as referred to above, where one reads from left to right; and anti-lexicographically, where one reads from right to left. The author is among those, the majority,

who prefer the lexicographic way. The reviewer, unfortunately, belongs to the opposite class. There is no reason to give the rationale for either point of view here since it really is just a matter of taste, but a person with long experience in one of these traditions will struggle when reading otherwise obvious material in the other. It seems awkward to the reviewer, for example, when small (positive) elements must have large values. And indeed, so that the order on the value set is correct when representatives are chosen, it is necessary to deal with the negative elements, rather than the positive. This difficulty, however, will probably not be a concern for those approaching this material for the first time.

This book can easily be read by those with little or no background in ordered structures or valuation theory. Except for the last chapter and appendix, where some familiarity with

model theory would be helpful, the author has taken great care to include all the necessary material. Throughout, the presentation is well motivated, and the discussion and proofs are clear and thorough. For those unfamiliar with ordered fields, this book will serve as a pleasant introduction to the subject. And for those already familiar with the subject, it is gratifying to see that the author has successfully dealt with the intriguing challenge of using the structure theory to describe the implications of the presence of an exponential function.

Chapter 0 contains background material on valuation theory and ordered modules. Chapter 1 is an introduction to ordered exponential fields and their structure. Chapter 2 deals with several growth axioms. These are various interpretations of the fact that the usual exponential function on  $\mathbb{R}$  "grows faster than any polynomial". Chap-

ter 3 describes the exponential rank, which is the order type of the exponential equivalence classes. If  $f$  is the exponential function on an ordered field, two elements  $a, b$  of the field are equivalent if for some  $n$ ,  $b < f^n(a)$  and  $a < f^n(b)$ . In Chapter 4 the author constructs models of exponential ordered fields. In Chapter 5, it is shown that the exponential rank can be any ordered set. Chapter 6 deals with Hardy fields, which are certain subfields of reduced powers of  $\mathbb{R}$ , and investigates the exponential functions thereon. A final appendix discusses the model theory of ordered abelian groups having a function corresponding to the exponential function. These are the structures that arise from an ordered exponential field with a "nice" exponential, when one considers the function induced on the value group of the field by the exponential function.

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## FROM THE INSTITUTES

### Fields Update

The major event this year at the Fields Institute is the thematic program in Numerical and Computational Challenges in Science and Engineering. There have been 4 graduate courses this fall: Numerical Linear Algebra (Christina Christara); Numerical Solution of ODEs (Wayne Enright and Ken Jackson); Numerical Solution of SDEs (Kevin Burrage); and a Short Course on Matrix Valued Function Theory (Olavi Nevanlinna). Two courses are planned for next semester: Numerical Solution of PDEs (Robert Almgren) and Numerical Solution of Optimization Problems (Henry Wolkowicz). During February 4 - 22, 2002, there will be a lecture series on Numerical and Computational Challenges in Environmental Modeling (Zahari Zlatev).

Two workshops will take place shortly – a Workshop on Computational Biology (November 29 - December 2) and a Workshop on Computational Challenges in Dynamical Systems (December 3 - 7). The first workshop in the new year will be the Week on Computational Challenges in Mathematical Finance (February 25 to March 1), followed by Optimization Visitors to the Fields Institute—a group of visitors in optimization at the Fields Institute before/during/after the SIAM Conference on Optimization to be held in Toronto May 20 - 22—and then on May 13 - 16 a Workshop on Numerical Challenges in Computer Animation, followed by an Informal

Working Group on Validated Methods for Optimization May 27 - 31.

The Coxeter Lecture series was given this fall by Gene Golub of the Department of Computer Science, Stanford University. The next Coxeter lecturer is Randall J. LeVeque of the Applied Mathematics Department at the University of Washington, who will talk on Solving Wave Propagation Problems in Heterogeneous Media, during the period March 4-15.

There are as well continuing seminars in many different areas, including the Fields Colloquium in Applied Mathematics, the Mathematics Education Forum, the Toronto Quantum Information seminar on quantum computing, and the String Theory Seminar.

Next year, the thematic programs at the Fields Institute will be on Set Theory and Analysis during the fall, and Automorphic Forms during the winter term. Applications for post-doctoral positions for these programs are due January 2, 2002.

Finally, a reminder that the Fields Institute can provide funding for graduate students (as well as post-doctoral students) to participate in Institute activities. Please see the Fields website [www.fields.utoronto.ca](http://www.fields.utoronto.ca) or write [geninfo@fields.utoronto.ca](mailto:geninfo@fields.utoronto.ca) for more information on this (or any other matter).

## Workshop on Calabi-Yau varieties held at Fields

A Workshop at the Fields Institute on “Arithmetic, Geometry and Physics around Calabi-Yau Varieties and Mirror Symmetry,” July 23 - 29, 2001, was organized by J. Lewis (Alberta) and N. Yui (Queen’s).



*S.T. Yau (Harvard), left, and Phillip Candelas (Oxford)*

One of the most significant developments in the last decade in theoretical physics (high energy) is, arguably, string theory and mirror symmetry. String theory proposes a model for the physical world in which the fundamental constituents are 1-dimensional mathematical objects “strings” rather than 0-dimensional objects “points”. Mirror symmetry is a conjecture in string theory according to which certain “mirror pairs” of Calabi-Yau manifolds give rise to isomorphic physical theories. Though the idea originated in physics, the field

of mirror symmetry has exploded in recent years onto the mathematical scene. It has inspired many new developments in algebraic geometry, toric geometry, Riemann surfaces, and infinite dimensional Lie algebras.

In the course of studying mirror symmetry, it has become apparent that Calabi-Yau varieties enjoy tremendously rich arithmetic properties. Arithmetic objects such as modular forms, modular functions of one or more variables, algebraic cycles, L-functions, and  $p$ -adic L-functions, have all appeared on the scene.

The goal of the workshop was to bring together experts, recent Ph.D.s and graduate students, working in or studying Calabi-Yau varieties and mirror symmetry in physics, geometry or arithmetic. There were 40 registered participants (mathematicians and theoretical physicists) from ten countries. The problem session on the last day of the workshop turned out to be a real hit. Many participants proposed future problems and research directions on Calabi-Yau varieties and mirror symmetry, and engaged in very lively discussions, causing them to almost forget the closing time of the workshop.

One of the significant outcomes of the workshop is that we are finally beginning to understand the mirror symmetry phenomena of Calabi-Yau threefolds from the arithmetic point of view, namely in terms of the relations between the zeta and L-functions of mirror pairs of Calabi-Yau manifolds.

The proceedings of the workshop will be published in the Fields Institute Communications Series. For further details of the workshop, see the website: [www.fields.utoronto.ca/programs/scientific/01-02/cyms](http://www.fields.utoronto.ca/programs/scientific/01-02/cyms).

## RESEARCH NOTES

Ian Putnam, Column Editor

### Canada-China Mathematics Congress

The second Canada-China Mathematics Congress was held at the University of British Columbia from August 20 to 23, 2001. The first congress was in China two years ago.

Many officials from both sides of the Pacific were in attendance. The Canadians included the President of NSERC, Dr. Tom Brzustowski, PIMS Director, Dr. Nassif Ghousoub, Fields’ Institute Director, Dr. Ken Davidson, Centre de Recherche Mathématiques Directeur, Dr. Jacques Hurtubise, CMS President-elect, Dr. Christiane Rousseau, MITACS Program Director, Dr. Arvind Gupta, UBC Vice-President Academic, Dr. Barry McBride and UVic Vice-President Research, Dr. Martin Taylor. The Chinese delegation included Zhi Xing Hou, President of Nankai University and Director of the Mathematical Centre of Chinese Education Ministry, Wang Jie, Vice director of Chinese Nature Scientific Foundation, Zhiming Ma, President of the Mathematical Society of China, L.Z. Peng, Secretary of the Mathematical Society of

China, K.C. Chang, Director of the Mathematical Centre of Chinese Education Ministry.

At the banquet, Dr. Ziming Ma issued a gracious invitation to all Canadian Mathematicians to attend the International Congress of Mathematicians next summer in Beijing and expressed his hopes that many of our community would be able to attend. He also gave a personal invitation to Dr. Brzustowski to attend. Dr. Brzustowski accepted and said he would look forward to the event. In his speech, Dr. Brzustowski gave his very positive view of mathematics and its critical role in modern science.

Overall, there were more than one hundred and thirty speakers at the conference and the program was a very full one. Special sessions were held in Algebra and Number Theory, Mathematical Physics and PDE, Probability and Statistics, Wavelets and their Applications, Computational, Industrial and Applied Analysis, Geometry/Topology, Operator Theory and Functional Analysis, Mathematical Finance and ODE and Dynamical Systems.

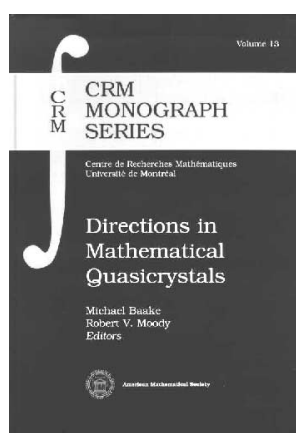
## Exploring the Idea of Order

Book review by Uwe Grimm, the Open University, Milton Keynes, UK

### Directions in Mathematical Quasicrystals

by Michael Baake & Robert V. Moody,

American Mathematical Society,  
Providence, Rhode Island, 2000  
CRM Monograph Series, vol. 13  
ISBN: 0-8218-2629-8



Although everyone has an intuitive perception of the concept of “order”, it is by no means obvious how to define and to characterize order in mathematical terms. As often, it is a good idea to look what Nature has to offer. In the physical world, the paradigm of order is a perfect crystal. Its regular macroscopic features derive from an underlying lattice structure where the atoms are arranged in a periodic fashion. The lattice structure can also be probed directly by diffraction experiments, for instance with X-rays or electrons. The diffraction images consist of beautiful point patterns, manifesting the long-range order and the symmetry of the atomic positions.

Some twenty years ago, a surprising discovery shook the perfect world of crystals. Certain materials, so-called quasicrystals, show diffraction patterns that are as point-like as those of crystals, but with symmetries that

are incompatible with lattice periodicity. Their mathematical description requires more general ordered structures than lattices. This stimulated the exploration of the vast expanse of possible manifestations of order that lie between the extremes of lattice periodicity and random disorder. There are still many open questions regarding such structures. To give an example, it is not known whether one can find a single tile such that the entire plane can be tiled by copies of it, but that any such tiling is aperiodic.

This is the fascinating realm of aperiodic order that is addressed by the contributions collected in the book under review. The title “Directions in Mathematical Quasicrystals” may be taken literally — the mathematics of aperiodic order is a young research topic, and this book is the third that arose from the research activity initiated by a workshop at the Fields Institute in 1995. As the two previous volumes (The mathematics of long-range aperiodic order, edited by R. V. Moody, Kluwer, Dordrecht, 1997; Quasicrystals and Discrete Geometry, edited by J. Patera, American Mathematical Society, Providence RI, 1998), it contains articles that explore various topics related to aperiodic order, emphasizing the deep and sometimes astonishing connections to many areas of mathematics. In particular, this includes algebraic number theory, combinatorics, geometry, measure theory, dynamical systems,  $C^*$ -algebras and  $K$ -theory, which all yield different views of the central topic, aperiodically ordered point sets and tilings in Euclidean space. These present different directions for the construction and the characterization of such sets, the topic as such not yet being complete in the sense that a definitive characterization of a “mathematical quasicrystal” still has to be found. But this is not the aim

of this volume, it serves to make the picture more coherent by putting together several pieces in the puzzle of aperiodic order, and by discussing how the various approaches used to construct aperiodically ordered systems are related to each other.

The individual articles were specifically written for this volume, by leading scientists in the field, among them several Canadian mathematicians. The articles present an overview of the current knowledge and also address many of the open questions. Some contributions are of introductory character and are easily accessible for readers who are not familiar with the topic, while some more technical papers contain detailed proofs of non-trivial results. Thus the mathematical background knowledge expected of the reader varies quite a bit between the contributions, but this is compensated by carefully prepared references to the literature.

A major part of the book is devoted to the characterization of point sets and tilings, in particular in terms of diffraction, which in mathematical terms is the Fourier transform of the autocorrelation measure. The construction of topological invariants for tiling spaces is beautifully explained, paving the way to a second main topic of the book, the spectral theory of aperiodic Schrödinger operators. The table of contents comprises the following entries: “Self-similar measures for quasicrystals” (M. Baake, R. V. Moody), “Fourier analysis of deformed model sets” (G. Bernuau, M. Duneau), “Mathematical quasicrystals and the problem of diffraction” (J. C. Lagarias), “Designer quasicrystals: Cut-and-project sets with pre-assigned properties” (P. A. B. Pleasants), “Generalized model sets and dynamical systems” (M. Schlottmann), “On shelling icosahedral quasicrystals”

(A. Weiss), “Tilings,  $C^*$ -algebras, and  $K$ -theory” (J. Kellendonk, I.F. Putnam), “Hulls of aperiodic solids and gap labeling theorems” (J. Bellissard, D. J. L. Herrmann, M. Zarrouati), “Quasicrystals, parametric density, and Wulff-shape” (K. Böröczky Jr., U. Schnell, J.M. Wills), “Gordon-type arguments in the spectral the-

ory of one-dimensional quasicrystals” (D. Damanik), “The planar dimer model with boundary: A survey” (R. Kenyon), “Digit tiling of Euclidean space” (A. Vince), supplemented by “A guide to quasicrystal literature”, a commented list of general references.

This collection provides ideal refer-

ence material for researchers who are active in the field as well as for any mathematician or theoretical physicist who is interested to learn more about this fascinating topic. It gives an up-to-date account of the present state of knowledge and monitors the rapid evolution of this intriguing field.

## AWARDS / PRIX

### Abel prize to be established



The Government of Norway has announced the establishment of a fund for an international prize in mathematics to commemorate Niels Henrik Abel (1802-1829).

“We need to strengthen mathematics and the sciences. Niels Henrik Abel was an internationally known Norwegian mathematician who nearly 200 years ago made a lasting impact in the world of science. An international prize in mathematics dedicated to his name is an expression of the importance of mathematics, and is intended to encourage students and researchers.”

The Norwegian Prime Minister, Mr. Jens Stoltenberg, made this announcement in Oslo in August, following the Government’s decision to grant NOK 200 million (USD 22 million) to a fund for a new international prize in mathematics. The Abel Prize will be awarded annually, and is intended to present the field of mathematics with a prize on the highest level.

The Abel Prize Fund will be established at the 200th anniversary for Niels Henrik Abel’s birth, in 2002. The annual income from the fund will be used for the prize and a major award event. Laureates will be appointed by an independent committee of international mathematicians.

“The Norwegian Government is working to focus more attention on mathematics and science than has been the case in recent years. The establishment of the Abel Prize is hoped to have several positive effects: increased interest among young people to study science, strengthening of the country’s research in the field of mathematics, increased awareness of Norway as a country of knowledge and learning, as well as positive international awareness”, the Prime Minister said.

Large parts of the western world are now seeing a lack of interest in science subjects. The prize is intended to underline the importance of mathematics and science and has already attracted wide support, in Norwegian as well as in international circles. Among others, the European Mathematical Society and the International Mathematical Union are behind the initiative.

An Abel Prize was first proposed in 1902, by King Oscar II of Sweden and Norway. However, plans were dropped as the union between the two countries was dissolved in 1905. Thus, the field of mathematics has never had an international prize of the same dimensions and importance as the Nobel Prize.

## EDUCATION NOTES

Ed Barbeau and Harry White, Column Editors

### Une invitation

Nous aimerions rappeler aux membres et aux collaborateurs de la SMC que cette rubrique est ouverte à toute contribution écrite en anglais ou en français traitant de sujets reliés à l'enseignement des mathématiques et pouvant prendre différentes formes telles que...

- 1) des nouvelles concernant des marques de reconnaissance pour des activités éducatives ;
- 2) une description de programmes innovateurs ou de formules pédagogiques personnelles efficaces ;
- 3) un point de vue basé sur l'expérience ou une opinion sur comment la SMC peut contribuer au développement professionnel des enseignants et des enseignantes ;
- 4) des problèmes intéressants pouvant être soumis aux étudiants et aux étudiantes, et qui font ressortir des éléments mathématiques et pédagogiques importants ;
- 5) une critique, sous forme de lettre aux éditeurs, en réaction à des textes qui ont été publiés dans les Notes ou se rapportant aux activités de la SMC reliées à l'éducation.

### A solicitation

I would like to remind members and friends of the Society that this column is open for your contributions, in either English and French. There are many ways in which this can be made:

- (1) news about honours received for educational activity;
- (2) a description of innovations in the design of programs or individual courses;
- (3) your views (which could be opinion or based on experience) on how we as a society can contribute to the professional development of teachers;
- (4) interesting problems that might be given to students that bring out important mathematical or pedagogical issues;
- (5) letters to the editor, particular in response to something that appears in these Notes or to some activity in education of the Society.

### An undergraduate teaching undergraduates

Richard Hoshino, despite his unassuming mien, is a remarkable person. A former member of Canada's team at the International Mathematical Olympiad, he decided that his calling might be to teach at the secondary level, and so joined the math-teaching program at the University of Water-

loo, graduating in 2001. During this time, he spent two co-op terms teaching mathematics to high school students, as well as obtaining his bachelor of education degree from Queen's University. Unlike most undergraduates in mathematics, he has also been a very active member of the Canadian Mathematical Society, particularly in the organization of problems training camps and preparing materials for high school problemists. He is studying for a Master's degree at Dalhousie University this year, with the support of an NSERC scholarship.

Readers might have noted an article about Richard in last May's *University Affairs*. As an undergraduate, Richard was bothered by the traditional lecture-based approach to the teaching of mathematics, which renders the student a passive observer rather than an active participant. He was disappointed that he never "had a chance to think in [his] class, to collaborate with [his] peers, or to brainstorm possible solutions". Noting that this sort of imposition of mathematics on undergraduates was a general feature of all universities, he asked for a chance to do better by teaching a third-year mathematics course during one of his co-op work terms. Despite some trepidation, the university officials were impressed sufficiently by his enthusiasm and experience to agree.

Modelling his problem-based learning approach on that of McMaster's School of Medicine, he took the role of a "tour guide" in introducing his students to interactive exercises and collaborative group work. The students were impressed, with 42 of the 46 course evaluations rating him as excellent and the remaining 4 as good. They praised the informal atmosphere and the chance to enjoy mathematics.

This is a man to watch.

### 3M Fellowship

The Society offers enthusiastic congratulations to Professor **Miroslav Lovric**, upon being awarded one of the ten annual 3M fellowships that recognize teaching excellence in Canadian universities. Readers of this column will already have some familiarity with Professor Lovric's work as a teacher of mathematics and statistics at McMaster University, particularly his innovative tutors course. (See *CMS Notes de la SMC* 32:5 (September, 2000), 11-12, and the website <http://icarus.math.mcmaster.ca/projects/2u3.html>.)

### The theatre line problem

Some time ago, in the *Olymon* series, I posed this problem: *A textbook problem has the following form: "A man is standing in line in front of a movie theatre. The fraction  $x$*



of the line is in front of him, and the fraction  $y$  of the line is behind him, where  $x$  and  $y$  are rational numbers written in lowest terms. How many people are there in the line?" Prove that, if the problem has an answer, then that answer must be the least common multiple of the denominators of  $x$  and  $y$ .

The students submitted some interesting solutions that raised important points about proof. This suggested to me that this problem might be useful more generally in school and university courses, as well as in workshops with pre-service and in-service teachers. The problem that motivated this appeared in a Grade 9 text, where the fractions  $x$  and  $y$  had the respective values  $5/6$  and  $1/7$ . Almost none of the students were able to garner a perfect score on this problem. What were the difficulties that they faced? First, note that the result is conditioned on the existence of a solution, which makes it somewhat unusual; not every pair of rationals  $x$  and  $y$  with sum less than 1 leads to a viable situation. Some may have

found the proof difficult because the result might have seemed just plain obvious (just think about it for a minute). The trick then is to somehow analyze one's thinking to get to the heart of the matter. For such a problem, can it be reduced to something more elemental and transparent than the result itself? Most of the student solutions failed to do this. Some went on for more than a page, and made assertions that, while correct, seemed more difficult to swallow than the desired conclusion. An important issue presented by this problem, particularly for the budding mathematician, is the need to polish an argument to make it as clear and as economical as possible; for this reason, it might lend itself a productive interchange between teacher and student until a preferred form is arrived at.

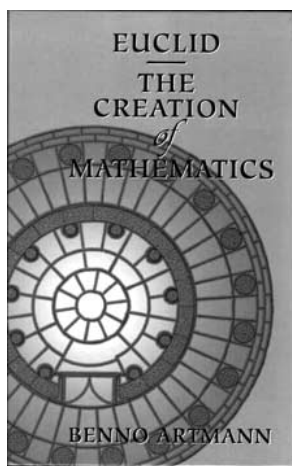
I would be interested in your thoughts on this and other questions. If you try it out with a group of students, tell us about the circumstances and what transpired.

## The Elements: an Inspiration, a Model, and a Textbook

Book review by A.C.Thompson, Dalhousie University

### Euclid—the Creation of Mathematics

by Benno Artmann  
Springer-Verlag New York, 2000  
xvi + 343 pp.



While there are surely fashions in mathematics, in the style of its presentation, the way it is taught, and the areas of active research, those who deal in the philosophy of mathematics must wrestle with its universal nature: the way it appeals across linguistic, cultural and

historical barriers. Perhaps no other phenomenon exhibits this universal appeal as much as Euclid's *Elements*. For 2300 years this book has served as an inspiration to mathematicians around the world, as a model of how mathematics (and other areas of knowledge) should be presented, and as a textbook. To philosophers it has often represented an embodiment of "objective truth".

In the last (i.e. 20th) century, the teaching of geometry in high schools (particularly in North America) went into serious decline. It is not uncommon to find undergraduate students – even of mathematics – who know very few of the "many cheerful facts" about triangles and circles. But now, at least in university classes for prospective teachers there appears to be some revival of interest. Is the best way to interest modern students to get them to look at ancient Greek mathematics? In addition to this book, I also have on my desk *Archimedes, what did he do besides cry Eureka?* by Sherman Stein and Robin Hartshorne's *Companion to Euclid*. All three show that an historical approach can be extremely successful.

Artmann's book would be a useful text for a class for teachers but has great appeal for anyone with a serious interest in mathematics.

The book is masterful and, for the most part, is a delight to read. In only 315 pages he manages to present the highlights of *The Elements* as Euclid presented them, the historical background and, most useful for a modern class, the way those ideas lead into recent mathematics – from the Renaissance to the present day. In addition, he is able to present some of the cultural background to Greek mathematics by way of art, philosophy, literature and architecture. I think this is a very impressive achievement.

However, more striking than the content is the style of presentation of the Propositions themselves. Surely a primary reason for the decline in the teaching of geometry was its presentation as a moribund subject – complete, unchanging, to be memorized – but also as a static subject (no transformations or functions that move the subject matter around). Here *Elements* is presented as a research monograph. One is shown

the trials and errors, the tentative approaches and the way the various pieces were developed to fit together (or, in some cases, not). In many places it is fascinating.

There are, naturally, some quibbles. There are quite a few misprints. Most frequently these are discrepancies between the letters on Figures and those in the text. Perhaps the many useful Figures went through a number of revisions that the text did not keep up with (or vice versa). For example, on pp. 114-115 Figures 13.1 and 13.2 seem to have been interchanged; in the text on p. 115  $CE$  should be  $DE$ ; and it would be useful if angles  $\alpha$  and  $\beta$  were marked in the left hand part of Figure 13.1. Further, on p. 130 the essence of the proposition is messed up by misprints: instead of  $BE : DF$  on the right of the first equation (which makes the implication a triviality) it should be  $AE : CF$ . A careful proof-reading would have caught more of these minor annoyances. Slightly more substantial, I find the ending of Chapter 6 a little fanciful and irrelevant – though I agree that bridging the two cultures is important! Likewise the details about Ro-

man dodecahedra that appeared most appropriately in *the Mathematical Intelligencer* (vol 15) seem somewhat out of place here. Perhaps omitting these would have left more room for those parts of the *Elements* that get a bit scrimped towards the end.

Some might want to argue with the subtitle, *the Creation of Mathematics*. What Artmann seems to have in mind here is not so much that Euclid was one of the first to organize mathematical knowledge, as that he identified so many of the themes that would continue to flow through mathematics in subsequent centuries. Interspersed through the book Artmann has 16 chapters headed *The Origin of Mathematics* in which he develops these themes. These are done wonderfully well. Many will think of the parallel postulate and its role in the history of geometry. Here we find the usual story of Saccheri, Gauss, Bolyai, Lobachevsky, Pasch and Hilbert but its impact on our view of truth and the nature of geometry is well told in few words. There is not space here to go into more details about these themes, perhaps it will suffice to give

some of the chapter titles: Parallels and Axioms; Squaring the Circle; Problems and Theories; the Birth of Rigor; Polygons after Euclid; Be Wise, Generalize; Nicomachus and Diophantus; Tools and Theorems; Math is Beautiful; Incommensurability and Irrationality; the Role of Definitions; the Taming of the Infinite; Symmetry through the Ages.

The culmination of Euclid's *Elements* is the construction of the five regular solids and, more importantly, the theorem that these are the only ones. Along the way we have seen Pythagoras's Theorem, a whole theory of proportion for possibly incommensurable quantities, and the proof of an infinity of prime numbers. Are there any other parts of human thought more universal than these? In the 19th century, Lewis Carroll wrote *Euclid and his modern rivals* (New York, Dover, 1973) with the aim of showing that one could not do better than read the original. Twentieth century pedagogues may have tried to declare that Euclid is dead; now Artmann proclaims "Long live Euclid!"

(EXEC—continued from page 1)

to report that Daryl Tingley (UNB-Fredericton), Bill Sands (Calgary) and Daniel Piché agreed to extend their terms as chairs of the Mathematical Competitions Committee, the International Mathematical Olympiad Committee, and the Student Committee, respectively. The CMS is very fortunate that these members have accepted to serve as editors and chairs of these important committees.

I would also like to welcome the new officers; Christiane Rousseau (Montréal) - President-Elect (2001-2002), President (2002-2004) and Past-President (2004-2005), Edgar Goodaire (Memorial), Bernard Hodgson (Laval), James Mingo (Queen's) and George Bluman (UBC) - vice-presidents (2001-2003), and the new members of the Board of Directors (2001-2005); Malgorzata Dubiel (SFU), Laurent Marcoux (Alberta), Ortrud Oellermann (Winnipeg), Richard Caron (Windsor), Kathryn Hare (Waterloo), Damien Roy (Ottawa) Galia Dafni (Concordia), Tomasz Kaczynski (Sherbrooke), Gordon MacDonald (UPEI), Abraham Punnen

(UNB - St. John), and Michael Overton (Courant). The CMS elects only one half of the directors at each election, so the new directors will join those whose terms end in 2003. All of the officers and directors will play a crucial role as the Society faces the many challenges that lay ahead.

The past summer did not only see a number of changes to our committees and Board of Directors but there were also some staff changes at the Executive Office. James Neusy was hired as the Accountant and Alan Kelm, the Camel Manager, moved from part-time to full-time. With the Society's significant growth overall and the increase in web-based services in particular, I am sure all of the staff at the Executive Office are going to be kept very busy.

The fall is when the CMS prepares the budget for the coming year and reviews the situation for the current year. I wish to thank the chairs, editors, meeting directors, the Treasurer, Arthur Sherk (Toronto), and the staff for their help in preparing the 2002 Budget materials. Although expenses for 2001 were very well controlled, revenues are down and a significant deficit is now projected for the year ending December 31,

2001. The 2002 Budget Proposal includes nominal increases to membership fees, subscription rates and advertising rates, together with an increase in grants and donations. The Budget Proposal submitted to the Finance Committee in October also projected a deficit for 2002. The Society is carefully considering what steps should can be taken to address this situation.

More and more of our members are retiring and the CMS provides complementary three-year memberships to new faculty at Canadian universities. At present, the loss of membership revenue from retiring members is not being replaced by the corresponding income from new faculty. One of our promotional activities is directed to those faculty whose complementary membership is coming to an end.

I wish to appeal to all members to renew their individual membership and to ensure their university or college is an institutional member of the CMS. Members can donate to a range of Society activities and I thank all those members who did make a donation in 2001 and I hope will do so again in 2002. Your help in encouraging your colleagues who are not CMS members to become a member is much appreciated. If any member wishes to become involved in any committee, publication or one of the wide array of activities please contact the Chair of the Nominating Committee - Cathy Baker (Mt. Allison, Email: chair-nomc@cms.math.ca). If you know of a company or agency that you consider may be a possible sponsor of the Society, either generally or for a specific activity, please contact me (director@cms.math.ca).

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## DU BUREAU DU DIRECTEUR ADMINISTRATIF

### Une période de transition

À l'assemblée générale annuelle tenue à Saskatoon, le rapport du secrétaire d'élection de 2001 a été accepté à l'unanimité. J'aimerais remercier tous les candidats à l'élection et féliciter les élus. Avant de passer à la présentation des nouveaux membres du Comité exécutif et du Conseil d'administration, je voudrais dire merci à ceux et celles qui ont terminé leur mandat en juin 2001.

J'aimerais d'abord remercier Richard Kane (Western), qui nous quitte après quatre années : il a été tour à tour président élu (1997-1998), président (1998-2000) et président sortant (2000-2001). La Société a grandement profité de l'expérience, des conseils et de l'excellent leadership de Richard. Un poste au Comité exécutif exige beaucoup d'énergie, particulièrement à une période où la SMC a passé l'ensemble de ses activités et programmes en revue. Merci particulièrement à Margaret Beattie (Mt. Allison), François Bergeron (UQAM), Thomas Salisbury (York) et Keith Taylor (Saskatchewan) de leur soutien et de leur bonne gouverne au cours des deux dernières années. Au nom de la Société, je remercie aussi sincèrement Jacques Bélair (Montréal), Jason Brown (Dalhousie), Robert Dawson (St. Mary's), François Dubeau (Sherbrooke), Penny Haxell (Waterloo), Jennifer Hyndman (UNBC), Anthony Lau (Alberta), Neal Madras (York), Karen Seyffarth (Calgary), Sylvia Wiegand (Nebraska) et Gail Wolkowicz (McMaster), qui ont siégé au Conseil d'administration au cours des quatre dernières années.

Le 30 juin 2001, James Mingo (Queen's) a cédé sa place comme président du Comité des publications; James Carrell (UBC) et Nassif Ghossoub (UBC) ont aussi terminé leur mandat comme rédacteurs en chef du Journal canadien de mathématiques. La qualité de nos publications est très élevée, et les recettes qu'ils rapportent sont primordiales à la santé

financière de la Société. Nous devons beaucoup à ces personnes, qui ont accompli un travail remarquable. Le nouveau président du Comité des publications est Keith Taylor (Saskatchewan), et les nouveaux rédacteurs en chef du Journal sont Henri Darmon (McGill) et Niky Kamran (McGill). Je suis aussi heureux de vous annoncer que Daryl Tingley (UNB-Fredericton), Bill Sands (Calgary) et Daniel Piché ont accepté de prolonger leur mandat à la présidence du Comité des concours de mathématiques, du Comité de l'Olympiade internationale de mathématiques et du Comité étudiant respectivement. La SMC est très privilégiée de pouvoir compter sur ces membres comme rédacteurs ou à la présidence de ces importants comités.

J'aimerais également souhaiter la bienvenue aux nouveaux membres du Comité exécutif : Christiane Rousseau (Montréal) - présidente élue (2001-2002), présidente (2002-2004) et présidente sortante (2004-2005); Edgar Goodaire (Memorial), Bernard Hodgson (Laval), James Mingo (Queen's) et George Bluman (UBC) - vice-présidents (2001-2003), et aux nouveaux membres du Conseil d'administration (2001-2005) : Małgorzata Dubiel (SFU), Laurent Marcoux (Alberta), Ortrud Oellermann (Winnipeg), Richard Caron (Windsor), Kathryn Hare (Waterloo), Damien Roy (Ottawa) Galia Dafni (Concordia), Tomasz Kaczynski (Sherbrooke), Gordon MacDonald (UPEI), Abraham Punnen (UNB - St. John) et Michael Overton (Courant). Comme la SMC n'élit que la moitié de son Conseil à chaque élection, les nouveaux membres se joindront à ceux dont le mandat se termine en 2003. Tous les membres du Conseil et du Comité exécutif joueront un rôle extrêmement important, car la Société ne manque pas de travail à accomplir ni d'obstacles à surmonter.

Les changements de personnel de l'été dernier n'ont pas touché seulement nos comités et le Conseil d'administration,

mais aussi le bureau administratif. M. James Neusy est notre nouveau comptable, et Alan Kelm, le responsable de Camel, est passé d'un statut à temps partiel à un statut à plein temps. Au rythme de croissance actuel de la SMC, et de ses services Web en particulier, je suis persuadé que le personnel du bureau administratif ne s'ennuiera pas.

L'automne est la saison où la SMC établit son budget pour l'année à venir et examine la situation de l'année en cours. Je tiens à remercier les présidents, les rédacteurs en chef, les directeurs de Réunions, notre trésorier, Arthur Sherk (Toronto), ainsi que le personnel de la Société de leur aide à l'établissement du budget 2002. Même si les dépenses de 2001 ont été très bien maîtrisées, nos revenus sont à la baisse, et nous prévoyons un déficit pour l'exercice qui prendra fin le 31 décembre. Le projet de budget 2002 comprend une légère augmentation des droits d'adhésion, des tarifs d'abonnement et des tarifs publicitaires, ainsi qu'une hausse des bourses et des dons. Le projet de budget 2002, qui sera présenté au Comité des finances en octobre, affiche également un déficit. La Société étudie attentivement les options qui lui permettrait de pallier son manque à gagner.

Une partie du problème tient au fait qu'un grand nombre de membres prennent leur retraite, et que la SMC offre

des adhésions gratuites de trois ans aux nouveaux professeurs d'universités canadiennes. En ce moment, la perte de revenus en adhésions des membres qui quittent n'est donc pas compensée par des revenus correspondants issus de nouvelles adhésions. L'une de nos activités de promotion cible justement les professeurs dont l'adhésion gratuite arrive à échéance.

Je demande à tous les membres de renouveler leur adhésion individuelle et de vérifier si leur université ou collègue est bien membre institutionnel de la SMC. Les membres ont aussi la possibilité d'affecter des dons à diverses activités de la SMC. Je profite de l'occasion pour remercier ceux qui ont fait un don en 2001, et j'espère qu'ils feront de même en 2002. Vos efforts à encourager vos collègues à devenir membres de la SMC sont grandement appréciés. Tout membre qui aimerait prendre part aux activités d'un comité, aux activités de publication ou autres de la Société est priée de communiquer avec la présidente du Comité de mises en candidature, Cathy Baker (Mt. Allison, courriel : [pres-nomc@smc.math.ca](mailto:pres-nomc@smc.math.ca)). Si vous pensez à une société ou à un organisme qui pourrait devenir commanditaire de la Société, soit en général, soit pour une activité en particulier, je vous prierais de communiquer avec moi ([directeur@smc.math.ca](mailto:directeur@smc.math.ca)).

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## LETTER TO THE EDITORS

Many mathematicians can name an individual whose influence was crucial for their mathematical development. As an undergraduate at the University of Toronto in the mid-1970's, I was profoundly influenced by the encouragement and teaching of Ray Vanstone.

During my first year as an Engineering Science student at the University of Toronto, I realised that my main academic interest lay in the application of mathematical methods to problems in physics. In second year, I became captivated by the calendar description of two fourth year courses offered by the Department of Mathematics: one on mathematical quantum mechanics and one on general relativity. However, for a student in Engineering Science, the sequence of prerequisites for these courses was daunting.

I approached some Professors in the Department of Mathematics to try to find a way to acquire the prerequisites before fourth year. No solution became apparent. I mentioned this to a Secretary in the Engineering Science office. She suggested that I contact Professor Vanstone, who she knew had been helpful on other occasions. I explained the situation to Professor Vanstone, who quickly proposed that I fill in my back-

ground by taking reading courses with him. I subsequently spent dozens of hours at the blackboard of his Sidney Smith office, during which he taught me linear algebra and differential geometry, smoking cigarettes all the while. His help with linear algebra was an essential component in my preparation for the course on mathematical quantum mechanics. For reasons I don't remember, I did not take the course on general relativity, but later when I was an MSc student in Mathematics Ray taught me about the mathematical structure of general relativity in his office high up in University College.

I was grateful to Ray during those years, for his generosity and willingness to help, for what he taught me, and for making it possible for me to enter the MSc program in Mathematics with an Engineering Science degree. Having made mathematics my career, and now better understanding the pressures on a Professor's time and what it meant for him to spend so much of his with me, I retain a deep sense of gratitude to Ray Vanstone. For this reason, I wanted to add my own tribute to those that accompanied his Obituary (*CMS Notes*, September 2001).

*Gordon Slade (University of British Columbia)*

## UPCOMING CONFERENCES

### Satellite Conferences, ICM2002, China

The next International Congress of Mathematicians, ICM2002, will take place August 20-28 in Beijing. Here is a list of satellite conferences, taken from the Congress website, [www.icm2002.org.cn](http://www.icm2002.org.cn). Detailed information about these conferences is available there.

- Mathematical Software—Beijing (August 17–19)
- Operator Algebra and Operator Theory—Chengde (August 14–18)
- Differential Geometry and Global Analysis—Tianjin (August 17–18)
- Mathematical Biology —Guilin (August 15–18)
- Symplectic Topology and Geometry—Chengdu (August 14–18)
- Ordinary Differential Equations—Lanzhou (August 30–September 4)
- Discrete, Combinatorial and Computational Geometry—Beijing (August 13–19)
- Combinatorics— Shijiazhuang (August 30–September 3)
- Nonlinear Functional Analysis— Taiyuan (August 11–19)
- International Colloquium for the History of Mathematics— Xi'an (August 14–18)
- Mathematics Education—Lhasa (August 12–17)
- New Directions in Dynamical Systems—Kyoto, Japan (August 5–15)
- Matrix Theory and Its Application—Shanghai (August 14–18)
- Scientific Computation—Xi'an (August 15–18)
- Clifford Analysis— Macau (August 16–19)
- Differential and Functional Differential Equations—Moscow, Russia (August 11–17)
- Cybernetics and Optimization—Xi'an (August 30–September 1)
- Algebra— Suzhou (August 29–September 2)
- Nonlinear Evolution Equations and Dynamical Systems—Huangshan (August 29–September 1)
- Algebraic Geometry—Shanghai (August 13–17)
- Computational Mathematics and Applications—Dalian (August 30–September 3)
- Geometric Function Theory in Several Complex Variables— Hefei (August 30–September 2)
- Nonlinear Partial Differential Equations-Theory and Approximation—Hong Kong (August 29–September 2)
- Number Theory and Arithmetic Geometry—Weihai (August 13–17)
- Nonlinear Partial Differential Equations in Mechanics and Physics—Harbin (August 29–September 3)
- Harmonic Analysis and its Applications—Hangzhou (August 14–18)
- Backward Stochastic Differential Equations—Weihai and Beijing (August 29–31)
- International Conference on Mathematical Logic—Chongqing (August 29–September 2)
- Symposium on Stochastics and Applications—Singapore (August 15–17)
- Geometric Topology— Xi'an (August 12–16)
- Game Theory and Applications—Qingdao (August 14–17)
- Combinatorics, Graph Theory and Applications—Hong Kong (August 15–17)
- Infinite Dimensional Function Theory—Pohang, South Korea (August 12–16)
- Several Complex Variables and Complex Geometry—Daejon, South Korea (August 14–18)
- International Conference in Algebras and related topics—Hong Kong (August 14–17)
- Complex Analysis—Shanghai (August 14–17)
- Electronic Information and Communication in Mathematics—Beijing (August 29–31)
- Difference Equations and Applications—Changsha (August 11–17)
- Algebraic Topology—Suzhou (August 30–September 3)
- Bifurcation and Chaos—Yunnan (August 13–17)
- An International Workshop on Mathematics Curriculum Reform in the 21st Century —Chongqing (Aug. 30–Sept. 2)
- Abstract and Applied Analysis—Hanoi, Vietnam (August 12–17)
- Stochastic Analysis—Beijing (August 29–September 3)
- Fractal Geometry and Applications—Nanjing (August 30–September 2)

## Canadian Number Theory Association – VII Meeting

May 19-25, 2002, Centre de Recherches Mathématiques, Montréal, Québec, Canada

**Short Description:** The purpose of the Canadian Number Theory Association (CNTA) is to enhance and promote learning and research in Number Theory. To advance these goals the CNTA organizes major international conferences, with the aim of exposing students and researchers to the latest developments in number theory worldwide.

The program consists of 45 plenary talks and over 100 contributed talks presented in five parallel sessions: Algebraic Number Theory (M. Kolster, McMaster), Analytic Number Theory (K. S. Williams, Carleton), Arithmetic Algebraic Geometry (E. Z. Goren, McGill), Computational Number Theory (G. Walsh, Ottawa), Diophantine Analysis and Approximation (D. Roy, Ottawa).

**Principal Speakers:** F. Amoroso (Caen), M. Bennett (Urbana-Champaign), A. Besser (Ben-Gurion), J. Borwein (Simon Fraser), D. Boyd (UBC), D. Brownawell (Penn. State), Y. Bugeaud (Strasbourg I), D. Burns (King's College), I. Chen (Simon Fraser), J. Coates (Cambridge), H. Cohen (Bordeaux), B. Conrad (Michigan), J. Cremona (Nottingham), H. Darmon (McGill), C. Deninger (Munster), W. Duke (UCLA), S. Edixhoven (Rennes), J. Friedlander (Toronto), F. Gouvea (Colby), R. Greenberg (Washington), A. Iovita (Washington), J. Lagarias (ATT Labs), M. Laurent (Luminy, CNRS), L. Merel (Paris VII), K. Murty (Toronto), R. Murty (Queen's), K. Ono (Wisconsin), G. Pappas (Michigan State), C. Pomerance (Bell Labs), B. Poonen (Berkeley), C. Popescu (Johns Hopkins), M. Rapoport (Köln), G. Rémond (Grenoble), Z. Rudnick (Tel-Aviv), R. Schoof (Rome II), K. Soundararajan (Michigan), W. Stein (Harvard), C. Stewart (Waterloo), V. Vatsal (UBC), P. Vojta (Berkeley), A. Weiss (Alberta), T. Wooley (Michigan).

**Information:** <http://www.math.mcgill.ca/cnta7>

**Deadline for submission of abstracts:** February 15, 2002. Contact the session organizer.

**Conference organizers:** H. Kisilevsky (Concordia) and E. Z. Goren (McGill).

## Lebesgue Integral 100 Years Old

The Lebesgue integral appeared 100 years ago, 29 April 1901, in the form of a note in the *Comptes rendus* entitled “Sur une généralisation de l’intégrale définie”. Lebesgue was then 25 years old. Here is how he explained his point of view, in a meeting in Copenhagen in 1926:

Avec le procédé de Riemann, on sommait les indivisibles dans l’ordre où ils étaient fournis par la variation de  $x$ . On opérait donc comme le ferait un commerçant sans méthode qui compterait pièces et billets au hasard de l’ordre où ils tomberait sous la main; tandis que nous opérons

comme le commerçant méthodique qui dit: j’ai  $m(E_1)$  pièces de une couronne, valant  $1.m(E_1)$ ; j’ai  $m(E_2)$  pièces de deux couronnes, valant  $2.m(E_2)$ ; j’ai  $m(E_5)$  pièces de cinq couronnes, valant  $5.m(E_5)$ , etc. Donc j’ai en toute

$$S = 1m(E_1) + 2m(E_2) + 5m(E_5) + \dots$$

For more see the article of Jean-Pierre Kahane “Naissance et postérité de l’intégrale de Lebesgue” in the July 2001 issue of the *Gazette des Mathématiciens*, from which this anecdote is taken.

### Did you know? ...

The CMS Office is on the University of Ottawa campus. All correspondence from participating Ontario universities can be sent IUTS - **free of charge**.

### Saviez-vous que? ...

Le Bureau administratif de la SMC est situé sur le campus de l’Université d’Ottawa. Toute correspondance provenant d’une université ontarienne peut être envoyée **gratuitement** via IUTS.

## CALL FOR NOMINATIONS / APPEL DE CANDIDATURES

### 2002 Canadian Mathematical Society Doctoral Prize Le Prix de doctorat 2002 de la Société mathématique du Canada

The CMS Doctoral Prize recognizes outstanding performance by a doctoral student. The prize is awarded to the person who received a Ph.D. from a Canadian university in the preceding year (January 1st to December 31st) and whose overall performance in graduate school is judged to be the most outstanding. Although the dissertation will be the most important criterion (the impact of the results, the creativity of the work, the quality of exposition, etc.) it will not be the only one. Other publications, activities in support of students and other accomplishments will also be considered.

Individuals who made a nomination last year can renew this nomination by simply indicating their wish to do so by the deadline date. Only materials updating the 2000 nomination need be provided as the original has been retained.

The CMS Doctoral Prize will consist of an award of \$500, a two-year complimentary membership in the CMS, a framed Doctoral Prize certificate and a stipend for travel expenses to attend the CMS meeting to receive the award and present a plenary lecture.

#### Nominations

Candidates must be nominated by their university and the nominator is responsible for preparing the documentation described below, and submitting the nomination to the address below.

No university may nominate more than one candidate and the deadline for the receipt of nominations is **January 31, 2002**.

The documentation shall consist of:

- A curriculum vitae prepared by the student.
- A résumé of the student's work written by the student and which must not exceed ten pages. The résumé should include a brief description of the thesis and why it is important, as well as of any other contributions made by the student while a doctoral student.
- Three letters of recommendation of which one should be from the thesis advisor and one from an external reviewer. A copy of the external examiner's report may be substituted for the latter. More than three letters of recommendation are not accepted.

La SMC a créé ce Prix de doctorat pour récompenser le travail exceptionnel d'un étudiant au doctorat. Le prix sera décerné à une personne qui aura reçu son diplôme de troisième cycle d'une université canadienne l'année précédente (entre le 1<sup>er</sup> janvier et le 31 décembre) et dont les résultats pour l'ensemble des études supérieures seront jugés les meilleurs. La dissertation constituera le principal critère de sélection (impact des résultats, créativité, qualité de l'exposition, etc.), mais ne sera pas le seul aspect évalué. On tiendra également compte des publications de l'étudiant, de son engagement dans la vie étudiante et de ses autres réalisations.

Il est possible de renouveler une mise en candidature présentée l'an dernier, pourvu que l'on en manifeste le désir avant la date limite. Dans ce cas, le présentateur n'a qu'à soumettre des documents de mise à jour puisque le dossier original a été conservé.

Le lauréat du Prix de doctorat de la SMC aura droit à une bourse de 500 \$. De plus, la SMC lui offrira l'adhésion gratuite à la Société pendant deux ans et lui remettra un certificat encadré et une subvention pour frais de déplacements lui permettant d'assister à la réunion de la SMC où il recevra son prix et présentera une conférence.

#### Candidatures

Les candidats doivent être nommés par leur université; la personne qui propose un candidat doit se charger de regrouper les documents décrits aux paragraphes suivants et de faire parvenir la candidature à l'adresse ci-dessous.

Aucune université ne peut nommer plus d'un candidat. Les candidatures doivent parvenir à la SMC au plus tard **le 31 janvier 2002**.

Le dossier sera constitué des documents suivants :

- Un curriculum vitae rédigé par l'étudiant.
- Un résumé du travail du candidat d'au plus dix pages, rédigé par l'étudiant, où celui-ci décrira brièvement sa thèse et en expliquera l'importance, et énumérera toutes ses autres réalisations pendant ses études de doctorat.
- Trois lettres de recommandation, dont une du directeur de thèse et une d'un examinateur de l'extérieur (une copie de son rapport fera aussi l'affaire). Le comité n'acceptera pas plus de trois lettres de recommandation.

Chair/Président

Doctoral Prize Selection Committee/Comité de sélection du Prix de doctorat

CMS Executive Office/Bureau administratif de la SMC

577 King Edward, Suite 109

P.O. Box 450, Station A/C.P. 450, Succursale A

Ottawa, Ontario Canada

K1N 6N5

**CMS Winter Meeting 2001**  
**Toronto Colony Hotel**  
**89 Chestnut Street, Toronto, Ontario**  
**December 8 - 10, 2001**

**Programme Update**

The most up-to-date information concerning the programmes, including scheduling, and electronic registration is available at the following world wide web address:

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

Meeting registration forms and hotel accommodation forms can be found in the September 2001 issue of the *CMS Notes* and are also available on the website, along with on-line forms for registration and submission of abstracts.

**Updates on Symposia Speakers**

There have been a number of additions to the list of invited speakers. Please refer to the web site for the most up-to-date information.

Abstracts will also appear on the web site as they become available.

**Réunion d'hiver de la SMC**  
**Hôtel Toronto Colony**  
**89, rue Chestnut, Toronto (Ontario)**  
**8-10 décembre 2001**

**Mise à jour du programme**

Vous trouverez l'information la plus récente sur les programmes, y compris les horaires et le formulaire d'inscription électronique, à l'adresse Web suivante :

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

Les formulaires d'inscription et de réservation d'hôtel seront aussi publiés dans le numéro de septembre 2001 des *Notes de la SMC*. Vous les trouverez également sur notre site web, ainsi que les formulaires de résumés de conférences.

**Liste de conférenciers**

Il y a eu quelques additions à la liste de conférenciers. Veuillez consulter le site Web pour l'information la plus récente.

Les résumés de conférences paraîtront sur le site dès que nous les recevrons.

**UNIVERSITY OF WATERLOO – WATERLOO, ONTARIO**  
**DEPARTMENT OF PURE MATHEMATICS**

The Department of Pure Mathematics at the University of Waterloo invites applications for an anticipated tenure-track position starting July 1, 2002. The Department is particularly interested in candidates with research interests in algebra, number theory, geometry or topology, though outstanding candidates in any area of Pure Mathematics will be considered.

In order to be considered for a position, a Ph.D. is required. Postdoctoral experience is preferred. An appointment will be offered only to someone with very strong research and teaching qualifications. **The closing date for receipt for applications is December 1, 2001.** Applicants should submit their curriculum vitae, together with the names of at least three referees, and should arrange for letters of reference to be sent directly from the referees.

In accordance with Canadian immigration requirements, Canadian citizens and permanent residents will be given first consideration for this position. The University of Waterloo encourages applications from all qualified individuals, including women, members of visible minorities, native people, and persons with disabilities. This appointment is subject to the availability of funds.

Please send applications to:

**Dr. B. Forrest, Chair,**  
**Department of Pure Mathematics,**  
**University of Waterloo,**  
**Waterloo, Ontario, Canada N2L 3G1**  
**The department's Web page is at:**  
[http://math.uwaterloo.ca/PM\\_Dept/homepage.html/](http://math.uwaterloo.ca/PM_Dept/homepage.html/)



**UNIVERSITÉ DE MONTRÉAL – MONTRÉAL, QUEBEC**  
**DÉPARTEMENT DE MATHÉMATIQUES ET DE STATISTIQUES**  
**Poste en mathématiques fondamentales**

Le Département de mathématiques et de statistique de la Faculté des arts et des sciences de l'Université de Montréal recherche une professeure ou un professeur adjoint(e) à plein temps en mathématiques fondamentales. Le Département collabore étroitement aux activités du Centre de recherches mathématiques (CRM). Le poste est ouvert sous réserve d'approbation budgétaire. Pour toute information sur le Département ou le CRM, veuillez visiter [www.dms.umontreal.ca/](http://www.dms.umontreal.ca/) et <http://www.crm.umontreal.ca/>.

*Fonctions* : Enseignement aux trois cycles, encadrement d'étudiants aux cycles supérieurs, activités de recherche.

*Exigences* : Détenir un doctorat en mathématiques. La préférence sera accordée aux candidates et candidats possédant une expertise dans l'un des domaines suivants : équations différentielles, équations aux dérivées partielles, analyse spectrale, analyse fonctionnelle géométrique, géométrie arithmétique, mais toute candidature de haut niveau en mathématiques fondamentales sera considérée. La qualité du dossier en recherche est primordiale. La candidate ou le candidat doit démontrer une excellente aptitude en enseignement.

*Traitement* : L'Université de Montréal offre un salaire concurrentiel jumelé à une gamme complète d'avantages sociaux.

*Date d'entrée en fonction* : Le 1er juin 2002.

Les personnes intéressées doivent faire parvenir un curriculum vitae complet incluant une courte description des intérêts de recherche, au moins trois lettres de recommandation et au maximum trois tirés à part des plus importantes contributions à la recherche, et ce **avant le 15 novembre 2001** (ou jusqu'à ce que le poste soit comblé), à :

*Conformément aux exigences prescrites en matière d'immigration au Canada, cette annonce s'adresse en priorité aux citoyens canadiens et aux résidents permanents. L'Université de Montréal souscrit à un programme d'accès à l'égalité en emploi pour les femmes et au principe d'équité en matière d'emploi.*

**UNIVERSITÉ DE MONTRÉAL – MONTRÉAL, QUEBEC**  
**DÉPARTEMENT DE MATHÉMATIQUES ET DE STATISTIQUES**  
**Position in Pure Mathematics**

The Department of Mathematics and Statistics of the Faculty of Arts and Sciences of the Université de Montréal invites applications for a tenure-track position in pure mathematics at the assistant professor level. The Department collaborates to the activities of the Centre de recherches mathématiques (CRM). The position is subject to budgetary approval. For more information on the Department or the CRM, visit [www.dms.umontreal.ca/](http://www.dms.umontreal.ca/) and [www.crm.umontreal.ca/](http://www.crm.umontreal.ca/).

*Duties*: Undergraduate and graduate teaching, supervision of graduate students, and research.

*Requirements*: To hold a Ph.D. in Mathematics. A preference will be given to candidates in one of the following areas: differential equations, partial differential equations, spectral analysis, geometric functional analysis, arithmetic geometry, but every outstanding candidate in pure mathematics will be considered. The research record is of prime importance. The candidate must possess excellent teaching skills. Courses are taught in French. Candidates who do not speak French must acquire an adequate knowledge of it within a reasonable period of time after the appointment.

*Salary*: The Université de Montréal offers competitive salaries and a complete package of social benefits.

*Starting Date*: June 1, 2002.

The interested candidates must submit a curriculum vitae including a concise statement of their research interests, at least three letters of reference, and copies of at most three of their most important research publications **before November 15, 2001** (or until the position is filled), to:

*In accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada. The Université de Montréal subscribes to an affirmative action program for women and to employment equity.*

**Directeur**  
**Département de mathématiques et de statistique**  
**Université de Montréal**  
**C.P. 6128, succursale Centre-ville**  
**Montréal QC**  
**H3C 3J7**  
**Téléphone : (514) 343-6743**  
**Télocopieur : (514) 343-5700**  
**Courriel : [mathstat@dms.umontreal.ca](mailto:mathstat@dms.umontreal.ca)**

**Chair**  
**Département de mathématiques et de statistique**  
**Université de Montréal**  
**C.P. 6128, succursale Centre-ville**  
**Montréal QC**  
**H3C 3J7**  
**Phone: (514) 343-6743**  
**FAX: (514) 343-5700**  
**email: [mathstat@dms.umontreal.ca](mailto:mathstat@dms.umontreal.ca)**

**UNIVERSITÉ DE MONTRÉAL – MONTRÉAL, QUEBEC**  
**DÉPARTEMENT DE MATHÉMATIQUES ET DE STATISTIQUES**  
**Poste en mathématiques ou statistique pour un boursier ou une boursière du programme APU du CRSNG**

Le Département de mathématiques et de statistique de la Faculté des arts et des sciences de l'Université de Montréal sollicite des candidatures féminines ou autochtones dans tous les domaines des mathématiques et de la statistique pour le Programme d'appui aux professeurs universitaires (APU) du CRSNG. La ou le titulaire de la bourse sera nommé(e) professeure ou professeur au rang d'adjoint. Une candidature exceptionnelle au niveau récemment agrégé pourrait être considérée. Le Département collabore étroitement aux activités du Centre de recherches mathématiques (CRM). Le poste est ouvert sous réserve d'approbation budgétaire. Pour toute information sur le Département ou le CRM, veuillez visiter [www.dms.umontreal.ca/](http://www.dms.umontreal.ca/) et <http://www.crm.umontreal.ca/>.

*Fonctions* : Enseignement aux trois cycles, encadrement d'étudiants aux cycles supérieurs, activités de recherche.

*Exigences* : Détenir un doctorat en mathématiques ou statistique. Être citoyen canadien ou résident permanent du Canada. Pour toute information sur le programme APU du CRSNG, veuillez visiter [www.nserc.ca/programs/schol4.f.htm](http://www.nserc.ca/programs/schol4.f.htm). La qualité du dossier en recherche est primordiale. La candidate ou le candidat doit posséder une excellente aptitude pour l'enseignement.

*Traitement* : L'Université de Montréal offre un salaire concurrentiel jumelé à une gamme complète d'avantages sociaux.

*Date d'entrée en fonction* : Le 1er juin 2002.

Les personnes intéressées doivent faire parvenir un curriculum vitae complet incluant une courte description des intérêts de recherche, au moins trois lettres de recommandation et au maximum trois tirés à part des plus importantes contributions à la recherche, et ce **avant le 1er octobre 2001**, à l'adresse ci-dessous:

**Directeur**  
**Département de mathématiques et de statistique**  
**Université de Montréal**  
**C.P. 6128, succursale Centre-ville**  
**Montréal QC H3C 3J7**  
**Téléphone : (514) 343-6743 Télécopieur : (514) 343-5700**  
**Courriel : [mathstat@dms.umontreal.ca](mailto:mathstat@dms.umontreal.ca)**

**UNIVERSITÉ DE MONTRÉAL – MONTRÉAL, QUEBEC**  
**DÉPARTEMENT DE MATHÉMATIQUES ET DE STATISTIQUES**  
**Position in Mathematics or Statistics for a NSERC's University Faculty Award Holder**

The Department of Mathematics and Statistics of the Faculty of Arts and Sciences of the Université de Montréal invites applications from talented females or Aboriginal researchers in all areas of mathematics and statistics for the University Faculty Awards (UFA) program of NSERC. The holder will be appointed at the assistant professor level. Exceptionally, an outstanding candidate at the associate professor level could be considered. The Department collaborates to the activities of the Centre de recherches mathématiques (CRM). The position is subject to budgetary approval. For more information on the Department or the CRM, visit [www.dms.umontreal.ca/](http://www.dms.umontreal.ca/) and [www.crm.umontreal.ca/](http://www.crm.umontreal.ca/).

*Duties*: Undergraduate and graduate teaching, supervision of graduate students, and research.

*Requirements*: To hold a Ph.D. in Mathematics or Statistics. To be Canadian citizen or permanent resident of Canada. For more information on NSERC's UFA program, visit [www.nserc.ca/programs/schol4\\_e.htm](http://www.nserc.ca/programs/schol4_e.htm). The research record is of prime importance. The candidate must possess excellent teaching skills. Courses are taught in French. Candidates who do not speak French must acquire an adequate knowledge of it within a reasonable period of time after the appointment.

*Salary*: The Université de Montréal offers competitive salaries and a complete package of social benefits.

*Starting Date* : June 1, 2002.

The interested candidates must submit a curriculum vitae including a concise statement of their research interests, at least three letters of reference, and copies of at most three of their most important research publications **before October 1, 2001** (or until the position is filled), to:

**Chair**  
**Département de mathématiques et de statistique**  
**Université de Montréal**  
**C.P. 6128, succursale Centre-ville**  
**Montréal QC H3C 3J7**  
**Phone: (514) 343-6743**  
**FAX: (514) 343-5700**  
**email: [mathstat@dms.umontreal.ca](mailto:mathstat@dms.umontreal.ca)**

**MCGILL UNIVERSITY – MONTREAL, QUEBEC  
DEPARTMENT OF MATHEMATICS AND STATISTICS**

The Department expects to fill one tenure-track position in Applied Mathematics, one in Pure Mathematics and one in Statistics in the coming academic year.

a. Applied Mathematics: The position is in scientific computing preferably in relation to partial/stochastic differential equations or dynamical systems and their applications. Applicants should have a strong background in Mathematics.

b. Pure Mathematics: The position is in number theory or geometry (algebraic, arithmetic or differential). Preference will be given to candidates with postdoctoral experience.

c. Statistics: 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.

While the appointments are expected to be made at the level of an Assistant Professor, the Department will consider applicants for senior position/s. Candidates should have a doctorate degree by the time of appointment. They are also 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 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:

**Professor J.P. Labute, Associate Chair  
Department of Mathematics and Statistics  
McGill University  
805 Sherbrooke St. West  
Montreal, Quebec, Canada H3A 2K6  
Email: labute@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 reprints or preprints with their application.

To ensure full consideration, applications must be received **by November 30, 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.

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**MCMASTER UNIVERSITY – HAMILTON, ONTARIO  
DEPARTMENT OF MATHEMATICS & STATISTICS  
Post-Doctoral Instructorships**

Applications are invited for post-doctoral fellowship positions in the Department of Mathematics Statistics. These fellowships provide an opportunity to spend up to two years engaged in research, with a limited amount of teaching, and are particularly suitable for talented young mathematicians who have recently completed the Ph.D. degree.

The Fellowships are open to candidates of any nationality and selection will be based upon the candidate's research potential. 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.

Starting July 1, 2002, the stipend will be \$37,600 plus a \$2,000 grant for research expenses.

Applications and three letters of reference should be sent **by January 15, 2002** to:

**Dr. M. Valeriote  
Chair  
Mathematics & Statistics  
McMaster University  
Hamilton, ON L8S 4K1  
CANADA**

We appreciate all replies to this advertisement, but only those applicants selected for our short list will be contacted.

**McMASTER UNIVERSITY – HAMILTON, ONTARIO**  
**DEPARTMENT OF MATHEMATICS & STATISTICS**  
**Canada Research Chair Post-Doctoral Fellowship**

Applications are invited for the Canada Research Chair Post-Doctoral Fellowship in Mathematics at McMaster University. These fellowships provide an opportunity to spend up to two years engaged in research, with a limited amount of teaching, and are particularly suitable for talented young mathematicians who have recently completed the Ph.D. degree. Fellowship holders will work under the supervision of Dr. Walter Craig, a holder of a Canada Research Chair in Mathematics at McMaster University. The Canada Research Chair Fellowship is open to candidates of any nationality and selection will be based upon the candidate's research potential. Research areas of particular interest include analysis, partial differential equations, Hamiltonian dynamical systems and applied mathematics.

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.

The Canada Research Chair Fellowship is tenable for a period of two years beginning July 1, 2002 at a salary of \$40,000 per year plus a research grant of \$5,000. Duties include research and the teaching of two courses per year.

Applications, including three letters of reference, should be received **before January 15, 2002** by:

**Dr. M. Valeriote**  
**Chair**  
**Mathematics & Statistics**  
**McMaster University**  
**Hamilton, ON L8S 4K1**  
**CANADA**

**Dr. W. Craig**  
**Canada Research Chair in Mathematical**  
**Analysis and its Applications**  
**Mathematics & Statistics**  
**McMaster University**  
**Hamilton, ON L8S 4K1**  
**CANADA**

**OR**

We appreciate all replies to this advertisement, but only those applicants selected for our short list will be contacted.

**McMASTER UNIVERSITY – HAMILTON, ONTARIO**  
**DEPARTMENT OF MATHEMATICS & STATISTICS**  
**Britton Post-Doctoral Fellowship**

Applications are invited for the Britton Post-Doctoral Fellowship in Mathematics, named after our former colleague Dr. Ronald F. Britton. These fellowships provide an opportunity to spend up to two years engaged in research, with a limited amount of teaching, and are particularly suitable for talented young mathematicians who have recently completed the Ph.D. degree.

The Britton Fellowship is open to candidates of any nationality and selection will be based upon the candidate's research potential. Research areas of particular interest include Geometry and Topology of Manifolds, Gauge Theory, and Group Actions.

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.

The Britton Fellowship is tenable for a period of two years beginning July 1, 2002 at a salary of \$40,000 per year plus a research grant of \$5,000. Duties include research and the teaching of two courses per year.

Applications, including three letters of reference, should be received **before January 15, 2002** by:

**Dr. M. Valeriote**  
**Chair**  
**Mathematics & Statistics**  
**McMaster University**  
**Hamilton, ON L8S 4K1**  
**CANADA**

**Dr. I. Hambleton**  
**Britton Professor of Mathematics**  
**Mathematics & Statistics**  
**McMaster University**  
**Hamilton, ON L8S 4K1**  
**CANADA**

**OR**

We appreciate all replies to this advertisement, but only those applicants selected for our short list will be contacted.

**McMASTER UNIVERSITY – HAMILTON, ONTARIO  
DEPARTMENT OF MATHEMATICS & STATISTICS  
McKay Post-Doctoral Fellowship**

Applications are invited for the McKay Post-Doctoral Fellowship in Mathematics, named after Dr. A.C. McKay, a former Dean and Chancellor of McMaster University. These fellowships provide an opportunity to spend up to two years engaged in research, with a limited amount of teaching, and are particularly suitable for talented young mathematicians who have recently completed the Ph.D. degree.

The McKay Fellowship is open to candidates of any nationality and selection will be based upon the candidate's research potential. Research areas of particular interest include Harmonic Analysis, Linear and Nonlinear Partial Differential Equations. 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.

The McKay Fellowship is tenable for a period of two years beginning July 1, 2002 at a salary of \$40,000 per year plus a research grant of \$5,000. Duties include research and the teaching of two courses per year.

Applications, including three letters of reference, should be received **before January 15, 2002** by:

**Dr. M. Valeriote**  
**Chair**  
**Mathematics & Statistics**  
**McMaster University**  
**Hamilton, ON L8S 4K1**  
**CANADA**

**Dr. E. Sawyer**  
**McKay Professor of Mathematics**  
**Mathematics & Statistics**  
**McMaster University**  
**Hamilton, ON L8S 4K1**  
**CANADA**

**OR**

We appreciate all replies to this advertisement, but only those applicants selected for our short list will be contacted.

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**McMASTER UNIVERSITY – HAMILTON, ONTARIO  
DEPARTMENT OF MATHEMATICS & STATISTICS  
Algebraic Geometry and Number Theory**

The Department of Mathematics & Statistics, McMaster University, invites applications for a tenured faculty position in Mathematics at the rank of Associate Professor or Professor, with anticipated starting date July 1, 2002.

The successful candidate should be internationally recognized for his or her fundamental contributions to research in a major area of Algebraic Geometry or Number Theory, be actively engaged in significant research projects, and have demonstrated excellence in teaching. Research areas of particular interest to the Department include Arithmetic Algebraic Geometry, Algebraic Number Theory and related areas. Information on the Department may be found at the website <http://www.science.mcmaster.ca/MathStat/Dept.html>.

For an appointment at the level of Professor of Mathematics the successful candidate should have attracted substantial research grant support and demonstrated leadership in organizing research efforts through the supervision of graduate students and postdoctoral researchers.

The salary and rank will be based on qualifications and experience.

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.

In accordance with Canadian Immigration requirements, Canadian citizens and permanent residents of Canada will be considered first for this position.

Applications, including curriculum vitae and three letters of reference, should be received **before January 15, 2002** by:

**Dr. M. Valeriote**  
**Chair**  
**Mathematics & Statistics**  
**McMaster University**  
**Hamilton, ON L8S 4K1**  
**CANADA**

**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, 2002. The Canada Research Chair Program is supported by the Government of Canada and was established to enable Canadian Universities to achieve the highest levels of research excellence. Information on the program may be found at <http://www.chairs.gc.ca>.

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 further information on the Department.

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, 2002**, by:

**Dr. M. Valeriote  
Chair  
Mathematics & Statistics  
McMaster University  
Hamilton, ON L8S 4K1  
CANADA**

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**UNIVERSITY OF WATERLOO – WATERLOO, ONTARIO  
DEPARTMENT OF COMBINATORICS AND OPTIMIZATION**

Applications are being invited for one or more tenure-track faculty positions, in any area of combinatorics and optimization, but especially in cryptography or quantum computing. While the intention is to make appointments at the rank of Assistant Professor, applications for positions at other ranks will be considered. A Ph.D. and significant evidence of ability in research and the potential for effective teaching are required. Responsibilities will include the supervision of graduate students, as well as teaching at the undergraduate and graduate levels. Successful candidates in cryptography or quantum computing will participate in the Centre for Applied Cryptographic Research or a proposed Institute for Quantum Computation at the University of Waterloo. Salary will depend on the candidate's qualifications. Effective date of appointment: July 1, 2002. These appointments are subject to the availability of funds. Canadians and permanent residents will be considered first for these positions. The University of Waterloo encourages applications from all qualified individuals, including women, members of visible minorities, native peoples, and persons with disabilities.

Interested individuals should send curriculum vitae, selected reprints/preprints and the names of three references to:

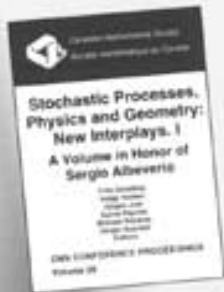
**Prof. W.H. Cunningham, Chair  
Department of Combinatorics and Optimization  
Faculty of Mathematics, University of Waterloo  
Waterloo, Ontario, Canada N2L 3G1  
e-mail: [combopt@math.uwaterloo.ca](mailto:combopt@math.uwaterloo.ca)  
phone: (519) 888-4567 x3482 fax: (519) 725-5441  
[http://www.math.uwaterloo.ca/CandO\\_Dept/homepage.html](http://www.math.uwaterloo.ca/CandO_Dept/homepage.html)**

Closing date for receipt of applications is **December 15, 2001**.

# AMERICAN MATHEMATICAL SOCIETY

## Conference Proceedings, Canadian Mathematical Society

These are our bestselling titles in this series. It 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 and II

A Volume in Honor of Sergio Albeverio

**Fritz Gesztesy**, *University of Missouri, Columbia*, **Helge Holden**, *Norwegian University of Science and Technology, Trondheim, Norway*, **Jürgen Jost**, *Max Planck Institut für Mathematik, Leipzig, Germany*, **Sylvie Paycha**, *Université Blaise Pascal, Aubiere, France*, **Michael Röckner**, *Universität Bielefeld, Germany*, and **Sergio Scariatti**, *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 among stochastic processes, mathematical physics, and geometry.

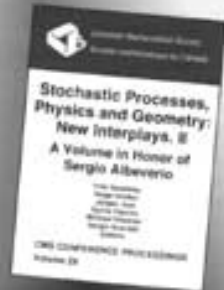
The contributions are written by internationally recognized experts in the fields of stochastic analysis, linear and nonlinear (deterministic and stochastic) PDEs, infinite dimensional analysis, functional analysis, commutative and noncommutative probability theory, integrable systems, quantum and statistical 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.

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**Conference Proceedings, Canadian Mathematical Society, Volume 28:** 2000; 333 pages; Softcover; ISBN 0-8218-1958-3; List \$75; individual member \$43; Order code CMSAMS28CMS01

**Conference Proceedings, Canadian Mathematical Society, Volume 29:** 2000; 647 pages; Softcover; ISBN 0-8218-1960-7; List \$125; individual member \$75; Order code CMSAMS29CMS01



### 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. **Conference Proceedings, Canadian Mathematical Society, Volume 27:** 2000; 289 pages; Softcover; ISBN 0-8218-2167-9; List \$70; individual member \$42; Order code CMSAMS27CMS01

### 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 modeling 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. It should be of interest to a broad mathematical audience. Members of the Canadian Mathematical Society may order at the AMS member price.

**Conference Proceedings, Canadian Mathematical Society, Volume 26:** 2000; 450 pages; Softcover; ISBN 0-8218-1063-4; List \$99; individual member \$59; Order code CMSAMS26CMS01



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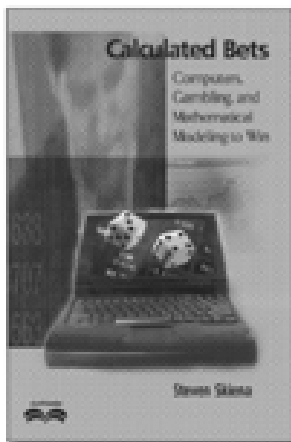
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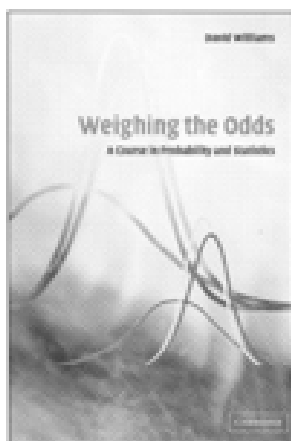
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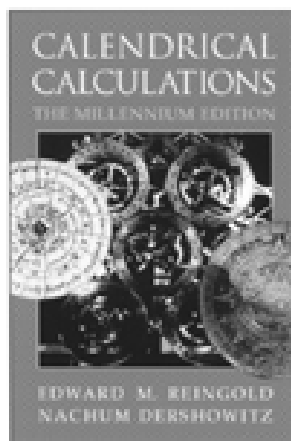
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## NEWS FROM DEPARTMENTS

### Carleton University, Ottawa, ON

Appointments: David Amundsen (Assistant Professor, applied mathematics, July 2001), Matias Salibian-Barrera (Assistant Professor, statistics, July 2001), Brett Stevens (Assistant Professor, discrete mathematics, July 2001), Yong You (Assistant Professor, half-time term position, statistics, July 2001). Marlene McCallum (Instructor, term position, algebra, September 2001) Arthur Vartanian (Assistant Professor, applied mathematics, July 2002).

Promotion: Wojciech Jaworski (Associate Professor with tenure, analysis, July 2001).

Retirements: Lawrence May, A.B.M. Lutful Kabir (June 30, 2001)

Other News: Cyril W.L. Garner appointed Director, August 2001.

### Concordia University, Montreal, QC

Appointment: Xiaowen Zhou (Assistant Professor, statistics, July 2001).

Resignation: A. Cauty (Assistant Professor, statistics, June 2001).

Death: Mohamed Abdul Malik. Dr. Malik began a 30-year career at Concordia University when he joined the Mathematics Department at Sir George Williams in 1967, after receiving his Ph.D. at the Université de Montréal. He was an active researcher in functional analysis, a scholar of the history of mathematics, and served the department in many administrative positions, including Chair.

Visitors: Alexey Kokotov (Russia, mathematical physics, Sept-Dec.2001), Andrei N. Tyurin (Russia, mathematical

physics, Sept.-Dec.2001), Man Wah Wong (Toronto, mathematical physics, Sept.-Dec.2001).



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Les avis d'adhésion 2002 était postés. S'il vous plaît renouveler votre adhésion maintenant.

## CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

### NOVEMBER 2001

**2–6** Workshop on the Geometry of Infinite Dimensional Lie Groups (CRM, Université de Montreal, Montreal)  
*activites@crm.umontreal.ca,*  
<http://www.CRM.UMontreal.CA/geometry/>

### DECEMBER 2001

**3–8** NIPS 2001, Neural Information Processing Systems: Natural and Synthetic (Vancouver, BC)  
*nipsinfo@salk.edu, http://www.cs.cmu.edu/Web/Groups/NIPS/*

**8–10** CMS Winter Meeting / Réunion d'hiver de la SMC (Toronto Colony Hotel, Toronto, Ontario)  
<http://www.cms.math.ca/CMS/Events/winter01>

**10–14** ICMI Study Conference on the Future of Teaching and Learning of Algebra (University of Melbourne, Australia)  
<http://www.edfac.unimelb.edu.au/DSME/icmi-algebra/>

### JANUARY 2002

**6–9** Joint Mathematics Meetings, San Diego, CA  
<http://www.ams.math.org/meetings/>

**21–28** Winter School on Computations in Coxeter Groups (CRM, Université de Montreal, Montreal)  
*activites@crm.umontreal.ca,*  
<http://www.CRM.UMontreal.CA/geometry/>

### FEBRUARY 2002

**2–3** 9th Southern California Geometric Analysis Seminar (UC at Irvine, CA)  
<http://www.math.uci.edu/scgas>

**27–March 3** Group Actions on Rational Varieties (CRM, Université de Montreal, Montreal)  
*activites@crm.umontreal.ca,*  
<http://www.CRM.UMontreal.CA/geometry/>

### MARCH 2002

**26–April 4** Instructional Conference on Combinatorial Aspects of Mathematical Analysis (ICMS, Edinburgh, UK)  
<http://www.ma.hw.ac.uk/icma/current/>

### APRIL 2002

**8–19** Invariant Theory (Queen's University, Kingston, ON)  
*activites@crm.umontreal.ca,*  
<http://www.CRM.UMontreal.CA/geometry/>

### NOVEMBRE 2001

### DÉCEMBRE 2001

### JANVIER 2002

### FÉVRIER 2002

### MARS 2002

### AVRIL 2002

**30–May 17** Concentration Period on the Langlands Programme for Function Fields (CRM, Université de Montreal, Montreal)  
*activites@crm.umontreal.ca,*  
<http://www.CRM.UMontreal.CA/geometry/>

### MAY 2002

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

**19–25** Canadian Number Theory Association Conference (CRM, Université de Montréal, Montréal)  
<http://www.math.mcgill.ca/cnta7>

**24–26** Annual meeting, Canadian Society for History and Philosophy of Mathematics / Société canadienne d'histoire et de philosophie des mathématiques (University of Toronto)  
<http://www.cshpm.org>

**27–June 10** Computational Lie Theory (CRM, Université de Montreal, Montreal)  
*activites@crm.umontreal.ca,*  
<http://www.CRM.UMontreal.CA/geometry/>

### JUNE 2002

**4–13** Linear Algebra Workshop (Bled, Slovenia)  
*luzius@mathstat.dal.ca, http://www.ijp.si/ftp/pub/stop/law/*

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

**10–15** Algebraic Transformation Groups (CRM, Université de Montreal, Montreal)  
*activites@crm.umontreal.ca,*  
<http://www.CRM.UMontreal.CA/geometry/>

**15– 17** CMS Summer Meeting / Réunion d'été de la SMC (Université Laval, Québec, Québec)  
<http://www.cms.math.ca/Events/summer02/>

**17–21** Seventh International Conference on p-adic Functional Analysis, (University of Nijmegen, The Netherlands)  
<http://www.sci.kun.nl/math/p-adic2002/>

**17–21** Householder Symposium on Numerical Linear Algebra (Peebles Hydro Hotel, near Edinburgh, Scotland)  
*p.a.knight@strath.ac.uk, http://www.maths.strath.ac.uk/matrix/*

**24–28** Special Activity in Analytic Number Theory (Max Planck Institute, Bonn) *moroz@mpim-bonn.mpg.de*

**25–28**, 8th International Conference on Applications of Computer Algebra Volos, Greece  
<http://www.uth.gr>; <http://www.volos-m.gr>

**JULY 2002****JUILLET 2002**

**22–30** 44th International Mathematical Olympiad (University of Strathclyde, Glasgow, UK)

**AUGUST 2002****AOÛT 2002**

**3–10** Logic Colloquium 2002, ASL European Summer Meeting (Westfälische-Universität, München, Germany)  
<http://www.math.uni-muester.de/LC2002>

**20–28** International Congress of Mathematicians (Beijing, China) <http://icm2002.org.cn/>

**DECEMBER 2002****DÉCEMBRE 2002**

**8–10 CMS Winter Meeting / Réunion d’hiver de la SMC (Marriott Hotel, Ottawa, Ontario)**  
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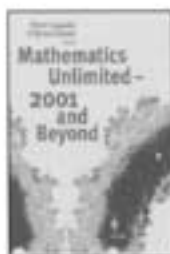
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