CMS NOTES de la SMC

REPORT OF THE PRESIDENT AND THE ADVANCEMENT OF MATHEMATICS COMMITTEE

IN THIS ISSUE
DANS CE NUMÉRO

H.E.A. (Eddy) Campbell
Memorial University, St. John's, NL

Mathematics in Canada is Stronger Again

2005 was an excellent year for mathematics in Canada. The national centre for excellence, the Mathematics of Information Technology and Complex Systems (MITACS) was renewed for another 7 year period. MITACS has a wide ranging mandate across the whole community of mathematical sciences to connect us to industry and provide new opportunities for researchers and graduate students. This renewal was a very important event for Canadian mathematics. The mathematical landscape in Canada has changed dramatically over the past decade. We now have three world-class research institutes: the Centre de recherche mathématiques (CRM) in Montreal; the Fields Institute (FI) in Toronto; and the Pacific Institute for Mathematics (PIMS) in Vancouver. There is also the Banff International Research Station (BIRS) which is supported also by institutes in the US and Mexico, and a virtual network in the Atlantic Association for Research in the Mathematical Sciences (AARMS).

The creation of this infrastructure has led to a tremendous increase in the quality and impact of the Canadian mathematical sciences. In turn, this has led to a new sense of community, a broader view of our beloved disciplines and new cooperative ventures involving the research institutes and many of our sister organizations both inside and outside the country. It is a very exciting time to be a mathematician in Canada!

Leaders of our communities continue to work together to further the cause of the mathematical sciences. We have formed a Liaison Committee with representatives from across the community to represent our common interests at NSERC. A document seeking to build a common vision for the future of the mathematical sciences in Canada is in draft form. Much has been done but there is much work remaining. It is critically important for our communities to remain politically engaged and to identify the next generation of leaders.

Our prizes continue to attract outstanding nominations. The quality of these nominations from all over the country speaks to the real and growing strength of mathematics in Canada. We have every reason to celebrate and to take pride. The CMS is a key player in promoting and enhancing Canadian mathematics. Our regular activities continue to flourish as you will see from the annual reports from our committees. Our regular meetings attract a large number of participants and increasingly are held jointly with our sister organizations. We have a very active publications programme, excellent high school mathematics competitions, both at the national and international level, a vibrant Math Camps program (there were 14 in 2005 with at least one camp in every province), electronic services for the community, and the Endowment Grants Competition. In my home province of Newfoundland and Labrador, my colleagues in the Department of Mathematics & Statistics are involved, in collaboration with local high school teachers, in a "Mathematics League". Students in grades 10, 11 and 12 gather on Saturday mornings in teams to work on carefully selected problems. Notably, many young women are involved.

français page 17

The Math Camps Program is an essential feature of our outreach programs. It is a great pleasure to acknowledge the continuing and on-going support of the Imperial Oil Foundation.

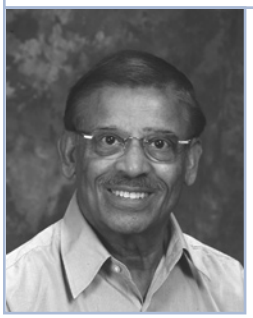
Canada School Mathematics Forum

The **2005 Canadian Mathematics Education Forum** was held in Toronto from May 6 - 8. The three co-chairs of the 2005 Forum were **Florence Glan-**

continued page 4

EDITORIAL

by S. Swaminathan
Dalhousie University, Halifax, NS



BIRTHDAYS IN MAY

It is well known that at least two persons can usually be found among a group of 60 people to share the same birthday. A perusal of the *MacTutor History of Mathematics* listing of birthdays of mathematicians reveals that on most days of the year there are as many as five reputed mathematicians having the same birthday. On some days there are ten mathematicians born on the same day and also there are days with only one mathematician listed. Quite a range, but typical for the Poisson distribution!

Thus on May 6th André Weil shares his birthday with Willem de Sitter, who is known for the Einstein-de Sitter model of the universe. Richard Feynmann was born on May 11th, as also T. von Karman, G.C. Evans, Edna Kramer, Sergei Chernikov and E. B. Dynkin. John Charles Fields and Rudolf Otto Lipschitz were both born on May 14th.

A. de Moivre, Yuri Sokolov and Otto Neugebauer share the May 26th birthday. And John Kemeny is the only person listed for May 31st .

If we wish to pick one mathematician among those born in May for a celebration many would agree that it must be John Charles Fields. Although most mathematicians know about the Fields Medal and the Fields Institute at Toronto, only very few are conversant with the early history of the Medal and the contributions of J. C. Fields. After undergraduate studies at the University of Toronto, graduate studies and Ph. D. from Johns Hopkins University, and research studies in various centers in Europe, Fields joined the University of Toronto in 1902 and rose from the ranks to a Research Professorship in 1923. His main research topic was on algebraic functions; he published a book on this subject in 1906.

J. C. Fields is best remembered for his zealous endeavors to promote research in mathematics and to obtain funding for it. He conceived the idea of an international award for excellence in mathematical research. He persuaded the International Mathematical Union to hold the international congress in Toronto in 1924. The financial support that he was able to obtain for this congress was so successful that there was a surplus, which provided the main incentive for his idea of an international medal. He canvassed for the medal and found support from various institutions. Ill health prevented him presenting his proposal in person at the Zurich Congress in 1932; he suffered from heart problems. A few days before his death he drew up a will, with J. L. Synge at his bedside, including an amount of $47,000 to be added to the funds for the medals. He did not live to attend the Congress but his plans were still put forward. Adopted at the International Congress of Mathematicians at Zurich in 1932, the first Fields Medals were awarded at the Oslo Congress of 1936.

The full story of how this idea became a reality is explained in Carl Riehm's excellent article on the early history of the Fields Medal in the *Notices of the AMS*, August 2002, 778-782. Canadian mathematicians are truly proud of J. C. Fields.

It is fairly well known that the Fields Medal is awarded for outstanding work by mathematicians who are not older than 40 years of age. Normally, such work includes the proofs of very important theorems. However, other factors may play a part. Steven Krantz, in *Mathematical Apocrypha* writes, "One wag characterized the situation as follows: William P. Thurston showed us that you can get the Fields Medal without proving a theorem, and Edward Witten showed us that you can get it without stating a theorem."

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ÉDITORIAL

by S. Swaminathan
Université Dalhousie, Halifax, N.-É.

JOURS DE NAISSANCE EN MAI

Comme vous le savez sans doute, on trouve presque toujours deux personnes ayant le même anniversaire dans un groupe de 60 personnes. En consultant la liste des anniversaires de mathématiciens du site d'archives *MacTutor History of Mathematics*, on constate que la plupart des jours de l'année, pas moins de cinq mathématiciens partagent le même anniversaire. Certains jours, on compte dix mathématiciens, d'autres, un seul — une variation typiquement Poisson.

Ainsi, le 6 mai a vu naître André Weil et Willem de Sitter, connu pour le modèle de l'univers Einstein-de Sitter. Richard Feynmann est né le 11 mai, tout comme T. von Karman, G.C.Evans, Edna Kramer, Sergei Chernikov et E. B. Dynkin. John Charles Fields et Rudolf Otto Lipschitz sont tous deux nés le 14 mai. A. de Moivre, Yuri Sokolov et Otto Neugebauer célébraient leur anniversaire le 26 mai, et John Kemeny est le seul mathématicien listé le 31 mai.

S'il fallait choisir de célébrer la mémoire d'un seul mathématicien né en mai, le nom de John Charles Fields rallierait sans doute la majorité. Même si la plupart des mathématiciens connaissent la médaille Fields et l'Institut Fields à Toronto, très peu connaissent l'historique de la médaille et les réalisations de J.C. Fields. Après des études de premier cycle à l'Université de Toronto, des études supérieures et un doctorat à John Hopkins, et des séjours de recherche dans plusieurs centres européens, J.C. Fields s'est joint à l'Université de Toronto en 1902 et y a gravi les échelons jusqu'au rang de professeur-chercheur, atteint en 1923. Son domaine de recherche principal était les fonctions algébriques. Il a publié un ouvrage sur le sujet en 1906.

J. C. Fields est surtout connu pour son ardeur à promouvoir la recherche mathématique et à obtenir du financement pour la recherche. On lui doit en outre l'idée d'un prix international d'excellence en recherche mathématique. C'est lui qui a persuadé l'Union mathématique internationale de tenir son congrès international à Toronto en 1924. Il est allé chercher un tel appui financier que le congrès a fini avec un surplus, qui a nourri son idée d'une médaille internationale. Il a fait la promotion de son projet et a obtenu d'autres fonds de diverses organisations. À cause de troubles cardiaques, il n'a pas pu présenter son projet en personne au congrès de Zurich en 1932. Quelques jours avant son décès, il a rédigé son testament, avec J. L. Synge à ses côtés, dans lequel il léguait 47 000 $ au fonds de la médaille. Il n'a pas vécu assez longtemps pour assister au congrès, mais son projet lui a survécu et a été adopté au Congrès international des mathématiciens tenu à Zurich en 1932. Les premières médailles Fields ont été décernées au congrès d'Oslo en 1936.

Pour connaître l'histoire intégrale de la réalisation de ce projet, je vous recommande un excellent article de Carl Riehm sur l'historique de la médaille Fields, publié dans les *Notices of the AMS* (août 2002, 778-782). La communauté mathématique canadienne est très fière de J. C. Fields.

Comme vous le savez probablement aussi, la médaille Fields est remise à des mathématiciens de moins de 40 ans pour leurs réalisations exceptionnelles. Généralement, ces réalisations comprennent les preuves de théorèmes très importants, mais d'autres facteurs entrent aussi en jeu. Dans *Mathematical Apocrypha*, Steven Krantz écrit ceci [traduction libre] : « Comme j'ai déjà entendu à la blague, William P. Thurston a montré qu'il est possible de décrocher la médaille Fields sans prouver de théorème, et Edward Witten, sans énoncer de théorème. »

Letters to the Editors
Lettres aux Rédacteurs

The Editors of the *Notes* welcome letters in English or French on any subject of mathematical interest but reserve the right to condense them. Those accepted for publication will appear in the language of submission. Readers may reach us at notes-letters@cms.math.ca or at the Executive Office.

Les rédacteurs des *Notes* acceptent les lettres en français ou anglais portant sur un sujet d.intérêt mathématique, mais ils se réservent le droit de les comprimer. Les lettres acceptées paraîtront dans la langue soumise. Les lecteurs peuvent nous joindre au bureau administratif de la SMC ou a l'addresse suivante: notes-lettres@smc.math.ca.

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field (Saskatchewan), **Bradd Hart** (McMaster) and **Frédéric Gourdeau** (Laval). The Forum brought together mathematics educators and administrators from universities and schools across the country with the goal of improving the teaching of mathematics in our schools.

The overall theme of the 2005 forum was "Why Teach Mathematics?" The format of the forum consisted of both plenary sessions and working group sessions. These included: approaches to early numeracy and age-appropriate mathematics education; strategies for increasing the number of highly qualified students in mathematically intense programs in science and engineering; mathematics education for students at risk; effective approaches to the education of all mathematics educators; and mathematics education and the aboriginal community. The working groups in the forum developed *projects*, *initiatives*, and *statements* that outline ways in which Canadians can address these issues and concerns.

Moreover, many provincial associations of mathematics teachers want to stay in contact and further develop the links created at the 2003 Forum in Montreal. The Advancement of Mathematics Committee has recommended that these Fora be held every three or four years and plans are underway to hold the next forum in the West.

Math in Moscow

We are delighted to acknowledge that NSERC has renewed its support for the Mathematics in Moscow program. In 2005, three scholarships were awarded (one at $10,000 and two at $9,500). These scholarships enabled Canadian students, registered in a mathematics or computer science program, to attend a semester at the Independent Moscow University. The calibre of students applying is truly outstanding.

Coxeter Commemorative Events

The CMS was a partner in the Renaissance Banff Conference held July 31 – August 3, 2005. The Renaissance Banff Conference was part of the International Bridges Conferences on Mathematical Connections in Art, Music and Science. The Conference was an initiative of Robert Moody and a collaborative effort by PIMS, the Banff Centre, the CMS and the Bridges Conferences. The last day of the event was designated as Coxeter Day in commemoration of the life and mathematics-arts connections of Donald Coxeter. The proceedings have been published and copies are available from the CMS Office in Ottawa at $25.00 (including shipping). You will find information on the Bridges Conferences at: **www.sckans.edu/~bridges**. The link to the 2005 Conference is **www.pims.math.ca/RenaissanceBanff/**

Membership Drive

Letters, signed by the President and Thomas Salisbury (President-elect), highlighting the advantages of being a CMS member have been sent to the chairs and heads of all mathematics related departments throughout the country. A membership retention program has been instituted which involves contacting members who have neglected to renew via telephone and email. Allowing our members to join on-line makes the task easy and convenient. A source of potential new members is researchers in theoretical computer science, as they have no home society in Canada. It is hoped that plenary lectures and sessions with such a focus will be featured at our semi-annual meetings.

Financial difficulties of the CMS

As our activities continue to grow, the cost of our activities used all of our available resources, and a significant deficit is projected for the fiscal year 2005. The Finance Committee formed a Task Force to examine all of our activities and to suggest ways and means of balancing the budget. In addition, the Board voted at its June meeting to create a fund-raising arm in an effort to identify partners for our many worthwhile activities, and we are planning a fund-raising campaign. The campaign will require widespread support from our membership – including donations, and much work from Executive and Board members.

The Imperial Oil Foundation continues to be the Title Sponsor of the National and Regional Math Camps. Sun Life Financial also continues as the Major Sponsor for the Canadian Mathematical Olympiad. Approaches have been made to provincial ministries of education to support our wide array of education activities. The NSERC PromoScience grant has been renewed for 3 years in support of our Math Camps program.

Challenges

The CMS is facing many challenges for the next year. We are forecasting a balanced budget which will require that new revenues are generated if we wish to maintain our current level of activity. We must ensure that newly hired faculty join the CMS and become volunteers for our activities. We need them to help increase the visibility of mathematics everywhere in the country and work so that mathematics becomes more popular in our schools. I would ask each of you to consider doing some recruiting in your own institution: the Executive Office can help you by sending you a brochure on the benefits of membership (**mpdesk@cms.math.ca**).

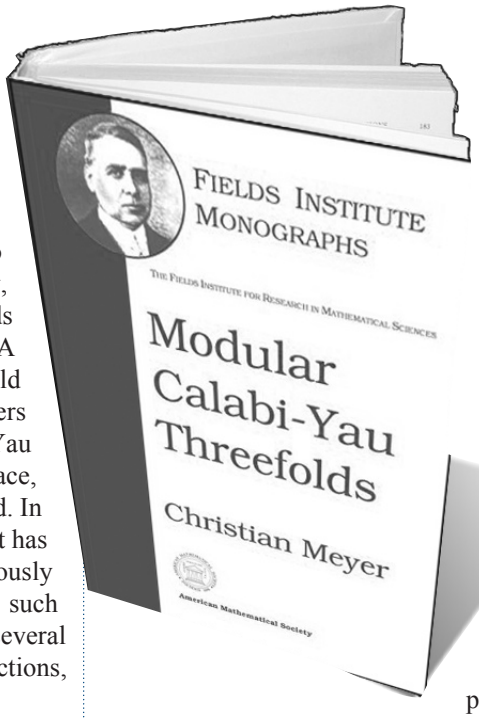
Thanks

We are extremely grateful to all the volunteers who work throughout the country bringing success to our activities: scientific and local organizers of meetings, members of our committees, organizers of our educational activities, editors of our journals, contributors to our publications. Special thanks go to the members of the staff of the Executive Office: each new activity brings fresh work to the Office. I owe a particular vote of thanks to Graham Wright and Tom Salisbury who have been a tremendous help and whose support has been invaluable. And we are very grateful to our many partners, sponsors and supporters.

by Noriko Yui
Queen's University

Modular Calabi-Yau Threefolds

by Christian Meyer
Fields Institute Monograph 22
AMS 2005 ix + 194 pages



One of the most significant developments in the last two decades in theoretical physics (high energy) is, arguably, string theory and mirror symmetry. Calabi-Yau manifolds are major players in string theory and mirror symmetry. A Calabi-Yau variety of dimension d is a complex manifold with trivial canonical bundle and vanishing Hodge numbers $h^{i,0}$, $0 < i < d$. For instance, a 1-dimensional Calabi-Yau variety is an elliptic curve, a 2-dimensional one is a $K3$ surface, and in dimension 3, we simply call it a Calabi-Yau threefold. In the course of studying string theory and mirror symmetry, it has become apparent that Calabi-Yau varieties enjoy tremendously rich arithmetic properties. For instance, arithmetic objects such as modular forms and modular functions of one and several variables, algebraic cycles, Galois representations, zeta-functions, L-series, among others, have popped up onto the scene.

The monograph by Meyer provides an introduction to arithmetic of Calabi-Yau threefolds from theoretical and algorithmic points of view. The main theme of the book is the connection between Calabi-Yau threefolds defined over the field **Q** of rational numbers and modular (automorphic) forms, along the line of the Langlands Program. A Calabi-Yau threefold over **Q** is said to be *modular* if its L-series is determined by modular (automorphic) forms. The book presents the general theory about modular Calabi-Yau threefolds, and hundreds of new examples of modular Calabi-Yau threefolds. Calabi-Yau threefolds are classified into two classes depending on the Hodge number $h^{2,1}$ (which is the dimension of the space of complex deformations) being zero or non-zero. In the first case, Calabi-Yau threefolds are said to be *rigid* and the latter case *non-rigid*. Rigid Calabi-Yau threefolds are the most natural generalizations of elliptic curves, which are 1-dimensional Calabi-Yau manifolds. The modularity of elliptic curves over **Q**, established by Wiles et al., is undoubtedly one of the monumental results in the last century. It asserts that every elliptic curve E defined over **Q** is modular in the sense that its L-series is parameterized by a modular form of weight 2=dim(E) +1 on some congruence subgroup of $PSL_2(\mathbf{Z})$ of finite index.

For a Calabi-Yau threefold defined over **Q**, one can define its L-series via the l-adic étale middle cohomology group. The general synthesis of the Langlands Program is that L-series is determined by modular (automorphic) forms. However, it is a difficult problem to actually determine modular (automorphic) forms that parameterize given Calabi-Yau threefolds over **Q**. Yet, there is one class of Calabi-Yau threefolds over **Q** which are accessible in this endeavor. They are rigid Calabi-Yau threefolds. Associated with a rigid Calabi-Yau threefold over **Q**, one has the 2-dimensional Galois representation, and it is possible to formulate the explicit modularity conjecture: *Every rigid Calabi-Yau threefold X over* **Q** *is modular in the sense that its L-series is determined by a modular form of weight 4=*dim*(X) +1 on some congruence subgroup of $PSL_2(\mathbf{Z})$ of finite index.*

For non-rigid Calabi-Yau threefolds over **Q**, the Galois representations associated to them have large dimension, and it is not even possible to formulate a precise conjecture. However, when the Galois representation is highly reducible and splits into the product of 2-dimensional pieces, the modularity question may be tackled. Meyer discusses some of these examples.

The book under review presents a large number of new examples of rigid and non-rigid modular Calabi-Yau threefolds over **Q**. The construction of Calabi-Yau threefolds is a challenging and interesting problem, and new examples of Calabi-Yau threefolds are constructed by considering double octics (double covers of $\mathbf{P}^3$ branched along an octic surface). The appendix contains tables of arrangements of eight planes defined over **Q**, modular double octics and and tables of modular forms of weight 4 and large levels.

The present monograph is a nice addition to the existing literature ([1],[2], and numerous research articles in mathematics and physics) on the arithmetic of Calabi-Yau varieties, and it will serve as a friendly introduction to graduate students as well as to researchers who wish to learn about the arithmetic aspects of Calabi-Yau varieties.

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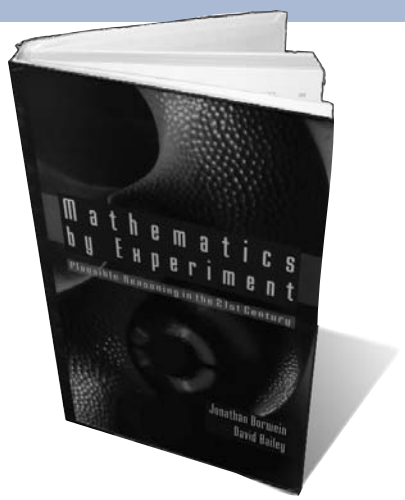
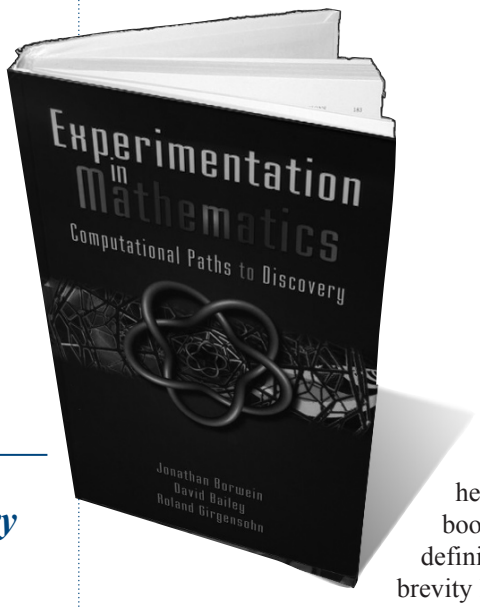
[1] *Calabi-Yau Varieties and Mirror Symmetry*, Fields Institute Communications Vol. 38, Noriko Yui and James D. Lewis (eds.), American Mathematical Society 2003.

[2] *Mirror Symmetry V*, AMS/IP Studies in Advanced Mathematics, Noriko Yui, Shing-Tung Yau and James D. Lewis (eds.), American Mathematical Society (to appear).

by Richard E. Crandall
Reed College





Mathematics by Experiment: Plausible Reasoning in the 21st Century

by Jonathan Borwein and David Bailey

A. K. Peters 2004, x + 288 pp.

Experimentation in Mathematics: Computational Paths to Discovery

by Jonathan Borwein, David Bailey, and Roland Girgensohn, A. K. Peters 2004, x + 357 pp.

This reviewer is compelled to admit right off: Perusal of these two books reminded me of my own college days at CalTech. You see, everything was fresh then, and I speak not merely of youth *per se*. Much of the scientific culture was driven in that era by the world view of the eminent physicist Richard Feynman. As brash as he was, he was also a pioneer of ideas—and not all of these ideas were immediately accepted by the professional community. I always thought that Feynman's life mission was not just to throw off the shackles of accepted science, but also to *replace* the past with something new; and from this reviewer's point of view, nothing is more intellectually exciting than that.

These two books, written by pioneers in the field of experimental mathematics, have provided us with a crisp snapshot of the state of that field at the dawn of this new century. Given that the general public embraced computers as "number-crunching" engines—and little more—for the first several decades of computing, it is really, now, in the early 2000s about time for computers to weld solidly to pure mathematics. These marvelous books underscore this revolution (there have been at least four computer revolutions by now; this reviewer is claiming experimental mathematics is yet another one), and such books absolutely have to be written, and read. This is the Feynmanesque excitement, then: Everything in this experimental field is fresh right now; moreover, the computational past is not merely being rejected, it is—at least in part—being replaced.

For readers who are not familiar with the historical and technical nuances of the phrase "experimental mathematics," a word here is appropriate. In the first book, the authors give a detailed definition which I paraphrase for brevity here:

"Experimental Mathematics *is that branch of mathematics that concerns itself ultimately with...insights...through the use of experimental...exploration...*"

The details omitted here give the authors' defining paragraph a philosophical bent; but for many readers their simpler, introductory definition

"*This new approach to mathematics—the utilization of advanced computing technology in mathematical research—is often called experimental mathematics*."

should suffice. Though it could be argued that experimental mathematicians have been around virtually forever (Gauss himself is certainly a candidate for the moniker), the modern era of experimental mathematics can be said to have begun in the early 1990s. The year 1992 saw the advent of the journal *Experimental Mathematics*, and one of the canonical anecdotes of the field was the 1993 *numerical* discovery by Enrico Au-Yeung—a student at U. Waterloo—that

$$\sum_{k=1}^{\infty}\left(1+\frac{1}{2}+\cdots+\frac{1}{k}\right)^2 k^{-2} \approx \frac{17\pi^4}{360}$$

in the sense that equality holds here to at least six significant decimals. One reads that it came to the attention of Borwein, Bailey, and Girgensohn that Au-Yeung's relation even held to 30 and later to 100 decimals, and eventually the relation was rigorously proved. This development in the experimental arena is especially refreshing in that here in the 2000s, there are extra reasons to take numerical work into the realms of extreme precision, thus leaking bright light once and for all into the "number-crunching" limbo of history.

Beyond such sparkling anecdotes, the books lead us through a forest of these experimental conjectures, and in many cases proofs of same. There are polylogarithmic discoveries in connection with knot theory and particle physics, problems from probability and statistics, and much more. It should be stressed that many identities remain unproven, even though they hold to thousands of decimals.

The books go well beyond just identity-finding and subsequent proving. There are discussions of fast arithmetic *per se*, Fourier transforms, normal numbers and digit expansions generally, some number theory, entropy principles, and on and on. There is—as expected, given the historical backgrounds of the authors—a lot about the number π, including the celebrated Bailey–Borwein–Plouffe formula that has led computationalists to know that the quadrillionth binary bit of π is a zero. This "BBP" formula has also led to some theorems and expectations on how normality proofs might go, in future, for certain fundamental constants. One important component of the books is the discussion of PSLQ, worked out by sculptor-mathematician Helaman Ferguson, as a computational scheme for finding linear relations of the form

$$r_1 x_1 + \cdots + r_n x_n = 0$$

where the x_k are known each to say hundreds or thousands of digits, and the PSLQ system finds *integer* coefficients r_k, or rules out the existence of the same, within norm limits on said coefficients. For example, the left-hand side of Au-Yeung's formula above could be x_1, to say 300 digits, and x_2 could be π^4 (or $\zeta(4)$) also to high precision, and PSLQ will report the Au-Yeung identity itself. This is not the same as proving, of course, but this reviewer believes that by today, 2006, the PSLQ relation-detection system has inspired about as many proofs as a good career teacher can inspire in a lifetime. And that should not be disturbing, for PSLQ is after all a human invention.

This reviewer wishes to convey a more personal anecdote in connection with these fine books. While perusing these books occasionally over several months, a problem concerning the Riemann zeta function at extreme imaginary height occupied my thoughts, and at one point I was about to give up because a certain expansion seemed not to have effectively boundable coefficients. Then by leafing serendipitously once again through these books, I realized the Lambert *W*-function was the creature at hand. What is more, the theory and examples and problems posed by the authors for this *W* amounted to a prefabricated tour of what I had to get through to solve my own problem! This little experience all by itself made the books precious to me.

One supposes a believable review must mention some drawbacks or imperfections, yet there are only minor ones in these books. The index (of each volume) could be perhaps significantly more dense. But the only real complaint this reviewer has is that he wishes there were just one 600-page book, because I need to take the books around often enough, and it is awkward to travel with a two-piece "experimental bible."

In closing, back once more to Feynman and his world view:

"The worthwhile problems are the ones you can really solve or help solve, the ones you can really contribute something to."
-Richard Feynman, 1966

So, in these volumes, the brave pioneers Borwein, Bailey, and Girgensohn have not only chosen worthwhile problems, in Feynman's sense of accessibility, but also shown us the pathways that will allow many of us readers to select worthwhile problems in the sense of personal achievement. These are two beautiful books, both of which belonging squarely on the desk of any aspiring discoverer, or—might I say it?—on the shelf of any historian of science.

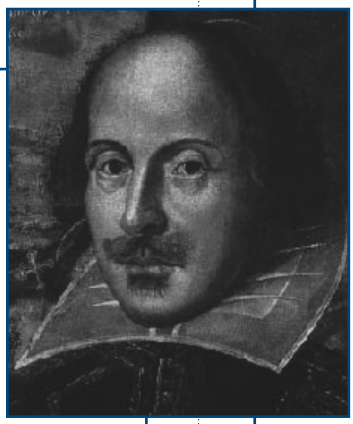
I do present you with a man of mine,

Cunning in music and in mathematics,

To instruct her fully in those sciences,

Whereof, I know, she is not ignorant.

William Shakespeare, Taming of the Shrew, Act 2, Sc.1.



Music and poesy used to quicken you:

The mathematics, and the metaphysics,

Fall to them as you find yur stomach serves you.

No profit grows, where is no pleasure ta'en:--

In brief, sir, study what you most affect.

William Shakespeare,
Taming of the Shrew, Act 1, Sc.1.

BRIEF BOOK REVIEWS

Peter Fillmore
Dalhousie University, Halifax, NS

Introduction to Circle Packing: The Theory of Discrete Analytic Functions

by Kenneth Stephenson

Cambridge 2005 xii + 356 pages US$60

Circle packings, in the modern sense, were first studied by Koebe in 1936, then independently rediscovered by William Thurston in the 1970s. A circle packing is loosely described as "a configuration of circles with specified patterns of tangency", and this suggests the central problem: given the tangency information, find the packing. The packings in question are built out of mutually tangent triples of circles, and the tangency pattern of a packing is contained in the associated simplicial 2-complex, which has a vertex for each circle, an edge for each tangent pair, and a face for each mutually tangent triple. The basic existence theorem states that if a complex K triangulates a surface S, there exists a Riemann surface R and a circle packing on it whose associated complex is K. The first half of the book is devoted to an explication of this theorem and its proof. Then the discussion moves to discrete analytic functions — which are naturally associated to circle packings — and their use in numerical approximation. For example, if G is a bounded simply-connected plane domain, then its Riemann mapping function is approximated by the discrete analytic functions associated to packings of G by circles of a fixed radius, as that radius goes to zero. This and very much more is presented in bravura style by Stephenson, who aims to entertain and instruct readers of whatever background — though some familiarity with surfaces and complex function theory would not be amiss.

Moments, Monodromy, and Perversity: A Diophantine Perspective

by Nicholas M. Katz

Annals of Mathematics Studies 159

Princeton 2005 viii + 475 pages

In 1974 Deligne proved a general equidistribution theorem, establishing the statistical properties of certain families of character sums over finite fields, and of their associated L-functions. To determine just which law applies to a given family, it is necessary to compute the "geometric monodromy group" attached to that family. In earlier work on this problem, Katz used methods which were partly local in nature; in the present book he introduces new techniques which are "resolutely global". These have two vital ingredients not available to Deligne: the theory of perverse sheaves, pioneered by Goresky and MacPherson, and Larsen's Alternative, which very nearly characterizes classical groups by their fourth moments. The author's goal is to calculate the geometric monodromy groups attached to some quite specific universal families, along the way developing general techniques — combining a diophantine analysis of perverse sheaves with Larsen's Alternative and other group-theoretic results — which are of interest in themselves.

A Sampler of Riemann-Finsler Geometry

David Bao et al, editors

MSRI Publications 50

Cambridge 2004 xii + 363 pages US$75

This is a collection of seven expository articles on several aspects of Riemann-Finsler geometry that have undergone important recent developments. Finsler geometry generalizes Riemannian geometry in the same sense that Banach spaces generalize Hilbert spaces. The titles are:

Volumes on normed and Finsler spaces (Alvarez and Thompson), Anisotropic and crystalline meancurvature flow (Bellettini), Finsler geometry on complex vector bundles (Aikou), Finsler geometry of holomorphic jet bundles (Chandler and Wong), Ricci and flag curvatures in Finsler geometry (Bao and Robles), Nonreversible Finsler metrics of positive flag curvature (Rademacher), and Landberg curvature, S-curvature and Riemann curvature (Shen). The editors' intention is to make these developments accessible to the differential geometry community at large. The articles have been refereed and carefully edited, and should be suitable for graduate-level topics courses in differential geometry.

Group Theory and Numerical Analysis

P. Winternitz et al, editors

CRM Proceedings and Lecture Notes 39

AMS 2005 xi + 298 pages

In May of 2003 a workshop on group theory and numerical analysis took place at the CRM, the theme of which was the application of group theory and geometrical methods to the solution of differential and difference equations. The emphasis was on the combination of analytical and numerical methods, and also the use of symbolic computation. The 20 papers in this volume cover such areas as: Lie group, geometric, and exponential integrators; symbolic computation and solutions of ODEs, PDEs, and differential-difference equations; symmetry preserving discretization of ODEs and PDEs; discrete and finite Fourier transforms and data processing; boundary layer perturbation theory and its symmetry respecting discretization; discrete symmetries of difference and differential-difference equations; numerical methods for treating rapid oscillations; orthogonal polynomials related to Padé approximations; applications in biophysics and physics.

by Ed Barbeau
University of Toronto

Geometry

With the desire to provoke discussion on areas of the syllabus that have been downgraded because of the discussion on calculus, I have asked some colleagues to give me their perspective on geometry. The first contribution, by Chris Fisher of the University of Regina, appears this month. He discusses the place of geometry at the tertiary level and, in particular, discusses his own course given to education students. To entice you into the text, I want to point out that it contains some nice examples.

While a case can be made for the utility of geometry, the more important consideration is surely that a student who is denied the opportunity to study geometry in school and university misses out on a significant and enjoyable way of doing mathematics. Elementary geometry - the geometry of circles and triangles - is an emblem of the fecundity of mathematics. As one familiar with mathematical contests, I am amazed at the richness and variety of results that concern these most elementary of geometrical figures and am certain that hundreds of years from now, new theorems will continue to come to light.

University geometry

Every few years or so, somebody writes an essay deploring the current state of geometry in the schools. Our mathematics journals have produced more than a century of such articles. To get a feeling for what has been said, I asked the *JSTOR* search engine for articles on teaching and geometry. (*JSTOR* is the Internet home for the journals of the Mathematical Association of America, among others; past articles are available to subscribers.) There seems to be general agreement that there has been a serious decline in the position of geometry with respect to other mathematics. Many writers feel that this decline helps explain why students are coming out of high school with little understanding of mathematics and with little ability to read or produce valid arguments. Not enough time is spent on geometry in high school, and that time is largely misspent. Lewis Carroll's musings on the topic in 1879 became the book, *Euclid and his Modern Rivals*. One might wonder, however, whether the decline that Lewis Carroll observed involved students who, like ours in Saskatchewan, are given a mere two-and-a-half weeks in grade 10 for learning and using formal proofs. Moreover, since geometry comes near the end of the text, many teachers feel that they have no time (or energy) left for geometry. According to the curriculum, students get another five weeks of geometry in grade 11, but it is in grade 10 where the idea of a proof is introduced. Anybody reading this article will surely have a personal list of reasons for studying geometry. There are geometric facts that everyone should know; there are many important applications; many people think geometrically. I maintain, however, that the principal reason for studying geometry is that geometry provides the best way to learn deductive reasoning. For that purpose, all students who intend to take any science course at university should take a year-long course entirely devoted to geometry in high school. Such courses are possibly extinct in North America.

There is little agreement on how much geometry to teach in the schools and less on how to teach it. Instead of addressing those contentious issues, my topic here will be restricted to teaching geometry in university to under-prepared students. Although I might agree with most analyses of the state of geometry, I agree with few of the suggestions on how to deal with the resulting problems. I will present my ideas on what should be taught and one way to teach it. At the University of Regina, we offer a 13-week geometry course that is compulsory for all education students who major in mathematics - those who intend to teach high school mathematics. Of the 40 or 50 students in the class, about half are these education students, and most of the others, taking the course as an elective, come from the faculty of science, majoring in mathematics, computer science, or the natural sciences. In addition to the facts of geometry, we are obliged to teach how to read, how to write, and how to study. Happily, Martin Isaacs has produced an outstanding text **[1]** that shares my goals. Unhappily, the text is overpriced by a factor of three - 215 pages at more than 50 cents per page, so I hesitate somewhat to recommend it.

The course I teach features some interesting theorems that follow quickly from the basic theorems of Euclid. Many of them are so surprising that the demand for some kind of proof comes from the students themselves. Take the *beer-can theorem*, for example: if three congruent circles all pass through a common point, then their second points of intersection lie on a circle congruent to the original three. (On a beach next summer, form three circles in the sand by pressing a beer can on a convenient pebble; the can will then fit neatly on the three points where the circles meet in pairs.)

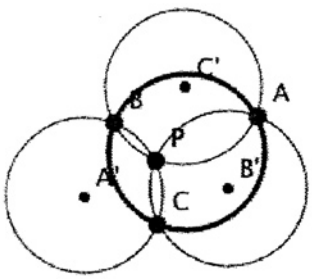


Figure 1a

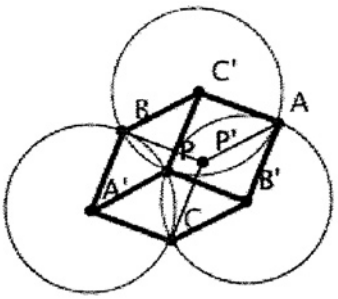


Figure 1b

One way to prove the result is to draw all nine radii, then note that the resulting configuration looks like the projection of a cube. Taking that hint, use the parallelograms to prove that the point P' in Figure 1b is at the required distance from A, B and C.

My approach to teaching geometry is somewhat like teaching swimming by throwing the learner into deep water. The first assignment, given on the first day and due two weeks later, calls for the proof of two nontrivial theorems like the beer-can theorem. (See my web page **[4]** for this semester's assignments and solutions.) I hand out a list of the basic theorems that are to be used to justify each step of a proof. These theorems are supposed to be known (according to the Saskatchewan syllabus) and usually the students admit to having seen most of them.

Isaacs begins his book with an apology that a good proof is just about impossible to describe; his idea is to illustrate good proofs through carefully worked examples. All his proofs are well-motivated and complete. He does not leave steps for the students to fill in; he does not say that the details are too complicated and should be looked up elsewhere; he avoids arguments that students would be unable to devise for themselves. I try to follow the author's lead by presenting good proofs in class. These are supplemented by discussions on where the ideas for a proof come from, and how it takes several revisions to work it into an acceptable form. The main idea for a proof in geometry come from an accurate figure. In the second lecture I show the students how to use the graphics program *Cinderella* **[3]**, software that is ideally suited for an elementary geometry course. The program can be quickly mastered, and its pictures are more stable under a change in initial conditions that those of rival programs (such as the popular and quite suitable *Geometer's Sketchpad*). Theorems for the students to prove should be challenging; but they should be accessible once an accurate figure is drawn. I give as many hints as needed to individual students who request my help. Some colleagues are dismayed by teaching proofs from pictures and by ignoring such niceties as betweenness and continuity. Please remember that this course represents a first step. (One hopes that our colleagues in physics still begin their treatment of falling bodies by ignoring the effects of friction.) For my course the theorems must be interesting; they must have a visual impact.

Among the articles I came across in my web search, one stood out: *Start where they are: Geometry as an Introduction to Proof* by J.E. McClure **[2]**. He argues that geometry should be used to teach university students the notion of a formal proof in so-called "bridge" courses — those designed to bridge the transition from formula-driven courses to courses where proof is emphasized. In the preface of his book, Isaacs makes the same point; he says that although several subjects could form the basis for a course in deductive reasoning, geometry is especially effective because it has the perfect balance of depth and concreteness — depth because the theorems tend to make surprising assertions, and concreteness because one can draw the appropriate figure and visualize the result. For most students, an understanding of proofs based on abstract axiom systems can come only after understanding proofs based on pictures. Since such proofs have been nearly eliminated from high schools, it is now the role of universities to teach them.

McClure provides a convincing argument for geometry that I can only summarize here. The course he recommends (as do I) calls for numerous proofs based on a basic list of theorems and a touch of cleverness. As in the beer-can theorem, the clever use of helping lines inserted into the figure is something that most students can devise. Here is an example that made clear to me how the average student learns. In class, I proved the theorem of Euler (Theorem 2.31 on page 77 in **[1]**) which asserts that for any triangle, the circumradius R, the inradius r, and the distance d between the circumcentre and the incentre satisfy the relationship

$$d^2 = R(R-2r) .$$

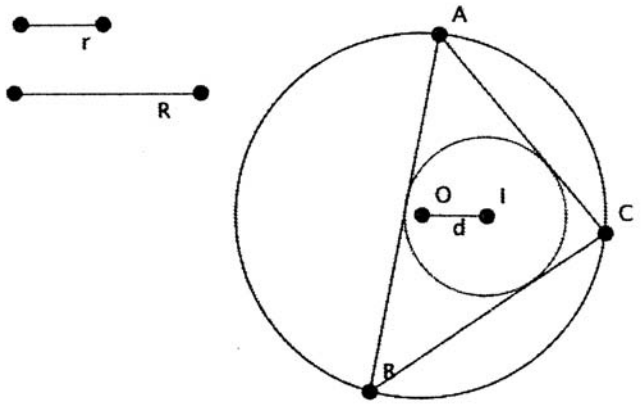


Figure 2

The proof is not particularly hard, and students seem to more or less understand it. I later assigned them the task of using *Cinderella* to construct a triangle given the lengths R and r. (See Figure 2.) Specifically, they were to start with (i) two line segments to the side of the screen labelled R and r, with $R \geq 2r$, (ii) a circle with centre O, radius R, and (iii) a point A on that circle; they were to construct a triangle ABC inscribed in that circle whose incircle had radius r. In other words, they were to construct the incentre I at a distance $\sqrt{R(R-2r)}$ from O, the circle with centre I and radius r, and the two tangents from A to the incircle. By a minor miracle, the extension of these tangents intersect the larger circle at two points B and C whose join is tangent to the smaller circle. Several students afterwards expressed their amazement to me. They were so excited they had to show their work to their friends and even to their parents. As one moves point A around the larger circle (as one can do with *Cinderella*), triangle ABC changes its shape considerably, but its sides stay tangent to the inner circle. Clearly, having drawn the figure for themselves, the students understood Euler's Theorem on a completely different level.

Here is another typical example. I proved Ptolemy's theorem (2.23, page 72 in **[1]**) in class: If a convex quadrangle is inscribed in a circle, then the sum of the products of opposite sides equals the product of the diagonals. The students filed it away wherever it is in their heads that such assertions are filed. Later, when I showed them how Ptolemy used his formula to prove that $\sin(A + B) = \sin A \cos B + \sin B \cos A$ (let one diagonal of the quadrangle be a unit diameter of the circle as in the figure), the students showed genuine excitement. A theorem is considerably more believable if it has tangible consequences.

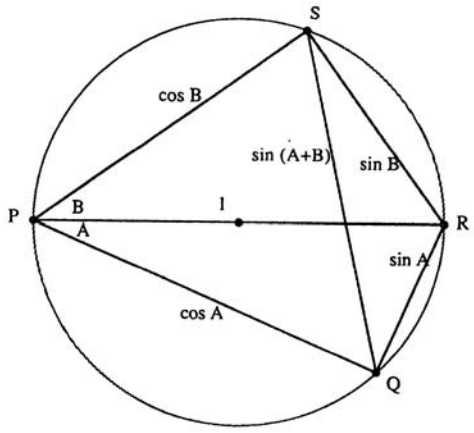


Figure 3 $PR \cdot QS = PQ \cdot RS + PS \cdot QR$

On the other hand, some proofs in geometry are subtle in a way that is hard for experienced mathematicians to realize. As an example of this McClure offers the theorem that if H is the orthocentre (the intersection of the three altitudes) of triangle ABC, then C is the orthocentre of triangle ABH. McClure claims that this proof requires subtlety that the students find relatively hard to grasp. To any mathematician the proof seems trivial; after all, it simply involves twice using the definition of orthocentre. But that is just the point: manipulating definitions requires another level of sophistication. McClure thinks that the difficulty might be that the steps in the proof cannot be easily related to the parts of the picture. Whatever the case, to my surprise my students indeed found the theorem hard to prove when I assigned it to them. McClure concludes from this and similar examples that it takes a great many pictorial proofs before a student is ready for subtlety and abstractions.

In McClure's course, after five weeks of increasingly difficult problems the students have enough understanding of subtlety to be able to turn to Euclid's *Elements*. He makes a strong argument in his paper for studying the original. Interestingly, his arguments for learning Euclidean geometry from Euclid recall those of Lewis Carroll from 120 years earlier. I certainly agree with those arguments, but I find the limited time in a one-semester course better spent studying Euclidean constructions. The final month of my course is based on Isaac's short chapter on geometric constructions, supplemented with excerpts from **[9]**. (Example from the quiz: *Construct triangle ABC given its orthocentre H, the midpoint M_a of BC and the foot H_b of the altitude from B.* Hint: the line from M_a perpendicular to the altitude BH_b bisects it.) These constructions provide opportunities to apply the theorems we have developed throughout the course and to visualize their implications.

After having taught this geometry course several times, I have no doubt that McClure is correct in claiming that geometry provides far better subject matter for a first encounter with deductive reasoning that either analysis or algebra. What have my students learned by the semester's end? They certainly do not write like professional mathematicians – for most of them, my course provided their first experience at writing mathematics. What they learn for certain is that they should start their homework when it is assigned (as opposed to starting it in their free hour before class), and that memorizing the statement of a theorem is no substitute for understanding it. That might be a modest start, but at least it is a start.

Finally, where does one find appropriate problems to assign? Isaac's book does not have enough problems, and I do not agree with his idea of giving hints to the students before they have had a chance to think about the problems. The *CMS* journal *Crux Mathematicorum with Mathematical Mayhem* is a reliable source; there is an appropriate problem or two in almost every issue. Every university library has old geometry texts on their shelves. Especially useful are the texts by Coxeter **[6]** and Eves **[7]** that were brought out to stem the decline of geometry in the 1960s and by Court **[5]** and by Johnson **[8]** to serve that purpose in the 1920s. It is interesting to observe the decrease in what their authors expected their readers to know from Lewis Carroll in 1880, to the texts of 1920 and 1960, and to Isaacs in 2000.

References

[1] I. Martin Isaacs, *Geometry for College Students*. Brooks/Cole, 2001.

[2] J.E. McClure, Start where they are: geometry as an introduction to proof. *American Math. Monthly* 107:1 (Jan., 2000), 44-52

Web pages

[3] Jürgen Richter-Gebert and Ulrich H. Kortenkamp, *Cinderella*, The Interactive Geometry Software. `http://cinderella.de/`

[4] Math 131 (Euclidean geometry), University of Regina, Winter, 2006. `http://www.math.uregina.ca/~fisher/math131/math131.html`

Sources for problems

[5] Nathan Altschiller Court, *College Geometry*. Barnes and Noble, 1965 (originally published in 1925)

[6] H.S.M. Coxeter, *Introduction to geometry*, second edition. Wiley, 1969

[7] Howard Eves, *Survey of Geometry*, revised edition. Allyn & Bacon, 1972

[8] Roger A. Johnson, *Advanced Euclidean Geometry*. Dover reprint, 1960

[9] Alfred S. Posamentier and Willima Wernick, *Geometric Constructions*. J. Weston Watch, Portland, ME, 1973

Chris Fisher, University of Regina

Geometry in the schools

Professor Fisher has referred to the use of geometry as an introduction to deductive reasoning. This is certainly true, as the subject contains results that are by no means obvious at first glance, such as the fact that a chord of a circle substends a constant angle at the circumference. But this point can be carried further. Proofs not only assure us of the validity of results, but also serve to clarify our ideas about results that seem to be obvious, particularly if, as in transformation arguments, they draw us into the structure of the situation.

It is unfortunate in the school curricular reforms of the last four decades that, having briefly introduced pupils to geometric transformation, they were not then utilized as powerful and insightful tools to confirm geometric results. I would argue that the use of transformations would allow geometry to be seriously embarked upon at an earlier grade than seems possible with the usual style of Euclidean deductive argument.

Consider, for example, the result that the base angles of an isosceles triangle are equal. This would not come as a surprise to a thoughtful pupil, but it is worth exploring why the result might seem so evident. There is evidently some kind of symmetry at stake. If we reflect the triangle in the bisector of the angle between the equal sides (fold it over this bisector), then one equal side gets transformed to the other, the vertices of the base get switched and we can deduce not only that the base angles are equal but that the angle bisector right bisects the base.

Another example of this sort of thing occurred one day with a grade 10 class. I was discussing the following problem: *Let ABCD be a unit square, and P, Q, R, S the respective midpoints of BC, CD, DA, AB. The segments AP, BQ, CR, DS bound an interior square. What is the area of the square?* After some time, one student asked how we knew that the interior figure *was* square. A great deal of discussion ensued, as the students realized that this was not such an easy question to decide. After several elaborate traditional proofs were attempted, I managed to get the students to realize that what made it so obvious was the symmetry of the figure, and it was just a matter of getting a handle on that symmetry. In fact, an easy argument can be found by analyzing the 90 degree rotation about the centre of the square.

These sorts of argument do not bludgeon students into submission by a line of logic, but allow them to see and understand the mechanisms that make a result true. While algebra and combinatorics are not without arguments of this type, geometry seems to be particularly well-suited to taking the students inside the structure.

EJB

First Joint SMM/CMS Meeting
Première réunion conjointe de la SMM-SMC

The Canadian Mathematical Society is pleased to announce the first joint meeting of the CMS and the Sociedad Matemática Mexicana (SMM). This meeting will be hosted by the Centro de Investigación en Matemáticas (CIMAT), and will take place in Guanajuato, Mexico, from September 21 to 23, 2006.

La Société mathématique du Canada (SMC) est heureuse d'annoncer le premier congrès conjoint SMC-SMM (Sociedad Matemática Mexicana). L'événement se tiendra au Centro de Investigación en Matemáticas (CIMAT), à Guanajuato, au Mexique, du 21 au 23 septembre 2006.

Plenary Speakers / Conférenciers pléniers

David Brydges (UBC); Gonzalo Contreras (CIMAT); Francisco Gonzalez Acuña (UNAM & CIMAT); Pengfei Guan (McGill); Jorge Urrutia (UNAM); Maciej Zworski (UC Berkeley).

Algebra/Algèbre
R. Buchweitz (Toronto), J. de la Peña (UNAM), A. Pianzola (Alberta)

Differential Geometry / Géométrie différentielle
P. Guan (McGill), L. Hernandez (CIMAT), M. Wang (McMaster)

Graph Theory & Combinatorics
Théorie des graphes & Combinatoire
I. Gitler (CINVESTAV), L. Goddyn (SFU), B. Reed (McGill)

Functional Analysis / Analyse fonctionnelle
H. Arizmendi (UNAM), T. Lau (Alberta), L. Palacios (UAM)

Localization & Partial Differential Equations
Localisation et Équations différentielles partielles
T. Minzoni (IIMAS-UNAM), M. Ward (UBC)

Low-Dimensional Topology / Topologie de faibles dimensions
Victor Nuñez (CIMAT), D. Rolfsen (UBC)

Mathematics Education – to be determined
Éducation mathématique - à determiner
M. Santillana (UPN)

Mathematical Physics / Physique mathématique
D. Brydges (UBC), S. Sontz (CIMAT), Carlos Villegas (UNAM-Cuernavaca)

Probability/Probabilité
M. Caballero (UNAM), V. Perez-Abreu (UAM-Cuajimalpa & CIMAT), T. Salisbury (York)

Topology/Topologie
A. Adem (UBC), J. Gonzalez (CINVESTAV), I. Hambleton (McMaster), D. Juan (UNAM-Morelia)

Variational Methods in Partial Differential Equations
Méthodes variationnelles en Équations différentielles partielles
L. Bronsard (McMaster), P. Padilla (IIMAS-UNAM)

Scientific Committee / Comité scientifique

CMS: Alejandro Adem (Chair/Président), Andrew Granville, Walter Craig; SMM: J.C. Gomez Larrañaga (Chair/Président), Lourdes Palacios, Fernando Brambila

Local Organizing Committee
Comité d'organisation à Guanajuato

Luis Hernandez-Lamoneda (Chair / Président), Victor Nuñez-Hernandez David Rivera-Caballero

www.cimat.mx

December 9 – 11 décembre
Sheraton Centre Toronto, Ontario

The Department of Mathematics, University of Toronto, is happy to announce the provisional outline for the Canadian Mathematical Society Winter 2006 Meeting, to be held at the Sheraton Centre Toronto in Toronto, Ontario. The first announcement will appear in the September 2006 issue of the *CMS Notes* and at **www.cms.math.ca/Events/**.

Le département de mathématiques de l'Université de Toronto est heureux d'annoncer les détails provisoires pour la Réunion d'hiver 2006 de la SMC, qui se tiendra au Sheraton Centre Toronto, Toronto, Ontario. Veuillez consulter la première annonce officielle dans le numéro de septembre des *Notes de la SMC* ainsi que notre site web **www.cms.math.ca/Reunions/** pour les informations les plus à jour.

PRIZES / PRIX

Conférencier Jeffery-Williams Lecture:
Andrew Granville

to be announced / à venir

Prix de doctorat / Doctoral Prize Lecture

Prix pour service méritoire de la SMC
CMS Distinguished Service Award

Prix Adrien Pouliot Prize

Prix G. de B. Robinson Award

PLENARY LECTURERS / CONFÉRENCIERS PLENIERS

Dmitry Dolgopyat
(University of Maryland)

Dimitri Shlyakhtenko
(UCLA)

Karen Smith
(University of Michigan)

Susan Tolman
(University of Illinois at Urbana-Champaign)

Shmuel Weinberger
(University of Chicago)

SESSIONS

Algebraic Combinatorics
Combinatoires algébriques
Org: Nantel Bergeron (York), Christophe Hohlweg (Fields Institute), Michael Zabrocki (York)

Calabi-Yau Varieties and Mirror Symmetry
Les variétés de Calabi-Yau et symétrie miroir
Org: James Lewis (Alberta), Noriko Yui (Queen's)

Commutative Algebra and Algebraic Geometry
Algèbre commutative et géométrie algébrique
Org: Ragnar Buchweitz (Toronto), Graham Lueschke (Syracuse), Greg Smith (Queen's)

Complexity and Computability in Analysis, Goemetry, and Dynamics / Complexité et calculabilité en analyse, géométrie et dynamique
Org: Alex Nabutovsky, Michael Yampolsky (Toronto)

Differentiable Dynamics and Smooth Ergodic Theory
Systèmes dynamiques différentiables et théorie érgodique lisse
Org: Giovanni Forni, Konstantin Khanin (Toronto)

Functional Analysis
Analyse fonctionnelle
Org: Robb Fry (Thompson Rivers), S. Swaminathan (Dalhousie)

Harmonic Analysis
Analyse harmonique
Org: Izabella Laba (UBC), Malabika Pramanik (Caltech; UBC)

History of Mathematics
Histoire des mathématiques
Org: Tom Archibald (SFU)

Knot Homologies
Homologie de nœuds
Org: Dror Bar-Natan (Toronto)

Mathematical Aspects of Continuum Physics: Analysis, Computation, and Modeling / Aspects mathématiques de la physique du continu: analyse, analyse computationnelle et modélisation
Org: Rustum Choksi (SFU), Mary Pugh (Toronto)

Mathematical Biology
Biologie mathématique
Org: Gail Wolkowicz (McMaster)

Mathematics Education
L'éducation mathématique
Org: Walter Whitely (York)

Nonlinear Schrodinger Equations
Équations de Schrödinger non linéaires
Org: James Colliander, Robert Jerrard (Toronto)

Poisson Geometry and Mathematical Physics
Géométrie de Poisson et physique mathématique
Org: Eckhard Meinrenken (Toronto)

Probability Theory and Operator Algebras
Théorie des probabilités et algèbres d'opérateurs
Org: Matthias Neufang (Carleton), Balint Virag (Toronto)

Representations of Algebras
Représentations des algèbres
Org: Ibrahim Assem, Thomas Brustle, Shiping Liu (Sherbrooke)

Contributed Papers
Communications libres
Org: Bill Weiss (Toronto)

Meeting Director / Directeur de réunion:
Ian Graham (Toronto)
Local Arrangements / Logistique locale:
Erich Ellers (Toronto)

BOOKS RECEIVED
LIVRES REÇUS

More books are received by the book review editor than we have space to review. In this column, which will appear at the end of each term, we list those books which will not be reviewed.

Notre rédacteur a reçu plus de livres qu'il ne peut publier de critiques. Dans cette rubrique, qui paraîtra à la fin de chaque trimestre, nous énumérerons les livres qui ne seront pas commentés.

Generation of Multivariate Hermite Interpolating Polynomials
by Santiago Alves Tavares
Chapman & Hall/CRC 2006 672 pages

A Fresh Start for Collegiate Mathematics: Rethinking the Courses below Calculus
edited by Nancy Baxter Hastings
MAA Notes 69 2006 396 pages

Handbook of Elliptic and Hyperelliptic Curve Cryptography
By Henri Cohen, Gerhard Frey et al
Chapman & Hall/CRC 2006 808 pages

Convex Analysis and Nonlinear Approximation: Theory and Examples, 2nd ed
by Jonathan P. Borwein and Adrian S. Lewis
CMS Books in Mathematics 3
Springer 2006 310 pages

Introduction to Fuzzy Systems
by Guanrong Chen and Trung Tat Pham
Chapman & Hall/CRC 2006 315 pages

Thermodynamics: A Dynamical Systems Approach
by W. Haddad, V. Chellaboina and S. Nersesov
Princeton 2005 187 pages US$49.50

Functional Analysis for Probability and Stochastic Processes
by Adam Bobrowski
Cambridge 2005 393 pages US$95 (hb) $48 (paper)

Graph Theory and Its Applications, 2nd ed
by Jonathan L. Gross and Jay Yellen
Chapman & Hall/CRC 2006 779 pages

A First Course in Fuzzy Logic, 3rd ed
by Hung T. Nguyen and Elbert A. Walker
Chapman & Hall/CRC 2006 430 pages

Cryptography: Theory and Practice, 3rd ed
by Douglas R. Stinson
Chapman & Hall/CRC 2006 593 pages

Nonlinear Analysis
by Leszek Gasinski and Nikolaos Papageorgiou
Chapman & Hall/CRC 2006 971 pages

Strange Functions in Real Analysis, 2nd ed
by A.B. Kharazishvili
Chapman & Hall/CRC 2006 415 pages

Authentication Codes and Combinatorial Designs
by Dingyi Pei
Chapman & Hall/CRC 2006 244 pages

A Concise Introduction to Pure Mathematics, 2nd ed.
by Martin Liebeck
Chapman & Hall/CRC 2006 204 pages

The Lévy Laplacian
by M.N. Feller
Cambridge 2005 153 pages US$70 (hb)

Fractional Cauchy Transforms
by Rita Hibschweiler and Thomas MacGregor
Chapman & Hall/CRC 2006 248 pages

Integral Geometry and Geometric Probability, 2nd ed.
by Luis Santalo
Cambridge 2004 404 pages US$50 (paper)

Applied Combinatorics on Words
by M. Lothaire

Encyclopedia of Mathematics and its Applications 105
Cambridge 2005 610 pages US$125

Complex Analysis and Applications, 2nd ed.
by Alan Jeffrey
Chapman & Hall/CRC 2006 581 pages

Mathematical Modelling in Continuum Mechanics, 2nd ed.
by Roger Temam and Alain Miranville
Cambridge 2005 342 pages US$50 (paper)

Moving Shape Analysis and Control
by M. Moubachir and J.-P. Zolésio
Chapman & Hall/CRC 2006 291 pages

Dynamics in One Complex Variable, 3rd ed.
by John Milnor
Annals of Mathematics Studies 160
Princeton 2006 304 pages US$45 (paper)

Index to Mathematical Problems 1975-1979
edited by Stanley Rabinowitz and Mark Bowron
MathPro Press 1999 518 pages US$69.95

PUTNAM DISTINCTION

Once again, Canadian students have performed with distinction in the 2005 Putnam Competition, written on December 3, 2005. Two Universities placed in the top ten, and two students ranked among the top 16 students. The University of Waterloo team with members Olena Bormashenko, Ralph Furmaniak and Xiannan Li placed fifth, closely followed in sixth position by the University of Toronto team with members Robert Barrington Leigh, Tianyi "David" Han and Jacob Tsimerman. Placing in the "N1" category (ranked 7 to 16 inclusive were Robert Barrington Leigh of the University of Toronto and Alexander R. Fink of the University of Calgary.)

Two students placed in the "N2" category (ranked 17 to 23 inclusive): Ralph Furmaniak of the University of Waterloo, and Roger Mong of the University of Toronto. Six students were honorably mentioned (ranked 27 to 70 inclusive): Olena Bormashenko and Elyot J. L. Grant from the University of Waterloo, Andrew J. Critch from Memorial University of Newfoundland, Gabriel E. Gauthier-Shalom and Mathieu Guay-Paquet from McGill University and Nima Kamoosi from the University of British Columbia.

Twenty-nine students from ten Canadian universities placed ranked up to 196. In all, there were 3545 candidates from 500 North American colleges and universities, 395 of which had teams of three. The Society congratulates all of these students on doing so well.

CALL FOR NOMINATIONS / APPEL DE MISES EN CANDIDATURE

The CMS Research Committee is inviting nominations for three prize lectureships. These prize lectureships are intended to recognize members of the Canadian mathematical community.

Le Comité de recherche de la SMC lance un appel de mises en candidatures pour trois de ses prix de conférence. Ces prix ont tous pour objectif de souligner l'excellence de membres de la communauté mathématique canadienne.

Prix Coxeter-James Prize Lectureship 2007

Le prix Coxeter-James rend hommage à l'apport exceptionnel à la recherche de jeunes mathématiciens. Il est possible de proposer la candidature d'une personne qui a obtenu son doctorat il y a au plus dix ans. Les propositions pourront être mises à jour et demeureront actives pendant un an, à moins que la mise en candidature originale ne corresponde à la dixième année d'obtention du doctorat. La personne choisie présentera sa conférence à la Réunion d'hiver. Les lettres de mise en candidature devraient inclure les noms d'au moins trois répondants possibles ainsi qu'un curriculum vitae récent, si disponible. Le récipiendaire doit être membre de la communauté mathématique canadienne.

The Coxeter-James Prize Lectureship recognizes young mathematicians who have made outstanding contributions to mathematical research. Nominations may be made up to ten years from the candidate's Ph.D. A nomination can be updated and will remain active for a second year unless the original nomination is made in the tenth year from the candidate's Ph.D. The selected candidate will deliver the prize lecture at the Winter Meeting. Nomination letters should include at least three names of suggested referees as well as a recent curriculum vitae, if available. The recipient shall be a member of the Canadian mathematical community.

Prix Jeffery-Williams Prize Lectureship 2008

Le prix Jeffery-Williams rend hommage à l'apport exceptionnel à la recherche de mathématiciens d'expérience. Les propositions pourront être mises à jour et demeureront actives pendant trois ans. La conférence sera présentée à la Réunion d'été. Les lettres de mise en candidature devraient inclure les noms d'au moins trois répondants possibles ainsi qu'un curriculum vitae récent, si disponible. Le récipiendaire doit être membre de la communauté mathématique canadienne.

The Jeffery-Williams Prize Lectureship recognizes mathematicians who have made outstanding contributions to mathematical research. A nomination can be updated and will remain active for three years. The prize lecture will be delivered at the Summer Meeting. Nomination letters should include three names of suggested referees as well as a recent curriculum vitae, if available. The recipient shall be a member of the Canadian mathematical community.

Prix Krieger-Nelson Prize Lectureship 2008

Le prix Krieger-Nelson rend hommage à l'apport exceptionnel à la recherche de mathématiciennes. Les propositions pourront être mises à jour et demeureront actives pendant deux ans. La conférence sera présentée à la Réunion d'été. Les lettres de mise en candidature devraient inclure les noms d'au moins trois répondants possibles ainsi qu'un curriculum vitae récent, si disponible. Le récipiendaire doit être membre de la communauté mathématique canadienne.

The Krieger-Nelson Prize Lectureship recognizes outstanding research by a female mathematician. A nomination can be updated and will remain active for two years. The prize lecture will be delivered at the Summer Meeting. Nomination letters should include three names of suggested referees as well as a recent currculum vitae, if available. The recipient shall be a member of the Canadian mathematical community.

La date limite pour les mises en candidature est le **30 juin 2006**. Faire parvenir vos lettres à l'adresse suivante :
The deadline for nominations is **June 30, 2006**. Letters of nomination should be sent to the address below.

J.F. Jardine, Chair/Président
CMS Research Committee / Comité de recherches de la SMC
Department of Mathematics
The University of Western Ontario
London, Ontario N6A 5B7 Canada

The 2006 Krieger-Nelson and Coxeter-James Prizes will be presented at the CMS Summer 2006 Meeting in Calgary, Alberta, June 3 to 5.
Les prix Krieger-Nelson et Coxeter-James 2006 seront présentés à la Réunion d'été 2006 de la SMC à Calgary (Alberta) du 3 au 5 juin.

RAPPORT DU PRÉSIDENT ET DU COMITÉ POUR L'AVANCEMENT DES MATHÉMATIQUES

par H.E.A. Eddy Campbell *Memorial University of Newfoundland*

Les mathématiques au Canada : de plus en plus vivantes

L'année 2005 a été une excellente année pour les mathématiques au Canada. Le Réseau de centres d'excellence en mathématiques des technologies de l'information et des systèmes complexes (MITACS) a vu à nouveau son financement renouvelé pour sept ans. Le Réseau MITACS, qui a un mandat très large auprès de toute la communauté mathématique, est notre contact privilégié avec l'industrie et offre de nouvelles avenues aux chercheurs et aux étudiants diplômés. Il s'agit d'un renouvellement très important pour la communauté mathématique canadienne. Le profil mathématique du Canada a subi une profonde transformation au cours des dix dernières années. Nous avons désormais trois instituts de recherche de renommée mondiale : le Centre de recherches mathématiques (CRM) à Montréal; l'Institut Fields (FI) à Toronto et l'Institut du Pacifique pour les sciences mathématiques (PIMS) à Vancouver. Nous avons également la Station de recherche internationale de Banff (SRIB), qui reçoit aussi du financement des É.-U. et du Mexique, ainsi qu'un réseau virtuel sous le nom de l'Association pour l'avancement de la recherche mathématique en Atlantique (AARMA).

La création de cette infrastructure a rehaussé considérablement la qualité et l'influence des mathématiques canadiennes, ce qui s'est traduit pas un nouveau sentiment d'appartenance, une perspective élargie de nos chères disciplines et la création de nouveaux partenariats avec nos instituts de recherche et de nombreux homologues du pays et de l'étranger. La profession mathématique ne manque certes pas d'intérêt au Canada ces temps-ci!

Les leaders de nos communautés collaborent toujours à l'essor des sciences mathématiques. Nous avons formé un comité de liaison avec des représentants de toute la communauté pour représenter nos intérêts communs au CRSNG. Nous avons entrepris la rédaction d'un document décrivant une vision commune de l'avenir des mathématiques au Canada. Le travail progresse bien, mais il reste encore beaucoup à faire. Il est extrêmement important pour nos communautés de demeurer engagées politiquement et de former la prochaine génération des leaders.

Nos prix suscitent toujours autant de candidatures exceptionnelles. La qualité des candidats de toutes les régions du pays illustre la force réelle et croissante des mathématiques au Canada. Nous avons de nombreuses raisons de nous réjouir et d'être fiers. La SMC est un acteur important de la promotion et du développement des mathématiques au Canada. Nos activités habituelles évoluent toujours, comme vous le verrez dans le rapport annuel de nos comités. Nos Réunions attirent de plus un grand nombre de participants et sont de plus en plus souvent tenues en partenariat avec d'autres associations sœurs. Nous avons en outre un programme de publications très chargé, d'excellents concours de mathématiques pour élèves du secondaire, tant au niveau national qu'international, des camps mathématiques très dynamiques (14 en 2005, dont au moins un par province), des services électroniques offerts à l'ensemble de la communauté et le concours de bourses du fonds de dotation. Chez moi, à Terre-Neuve-et-Labrador, mes collègues du Département de mathématiques et de statistique ont formé une « ligue de mathématiques » en collaboration avec des enseignants du secondaire. Des élèves de 10^{e}, 11^{e} et 12^{e} année se réunissent les samedis matins et forment des équipes pour résoudre des problèmes soigneusement choisis. Soulignons qu'un grand nombre de jeunes femmes participent à ces activités.

Les camps mathématiques sont un élément important de nos programmes de sensibilisation. Je remercie chaleureusement la Fondation philanthropique Pétrolière Impériale de son appui à ce programme.

Forum canadien sur l'enseignement des mathématiques

Le **Forum canadien sur l'enseignement des mathématiques 2005** s'est tenu à Toronto du 6 au 8 mai 2005. La coprésidence du forum 2005 était assurée par **Florence Glanfield** (Saskatchewan), **Bradd Hart** (McMaster) et **Frédéric Gourdeau** (Laval). Ce forum a réuni des enseignants de mathématiques et des administrateurs d'universités et d'écoles de tout le pays, toujours dans l'optique d'améliorer l'enseignement des mathématiques dans nos écoles.

Le forum 2005 s'est déroulé sous le thème « Pourquoi enseigner les mathématiques? » Le programme offrait des conférences plénières ou principales ainsi que des séances de travail en groupe sur divers sujets : stratégies d'enseignement des notions de calcul à la petite enfance et enseignement des mathématiques adapté à l'âge des enfants; stratégies d'augmentation du nombre d'étudiants très forts en mathématiques dans les programmes de sciences et de génie à forte teneur mathématique; l'enseignement des mathématiques aux élèves à risque; méthodes efficaces d'enseignement aux futurs enseignants de mathématiques; l'enseignement des mathématiques aux Autochtones. Les groupes de travail formés lors du Forum ont élaboré des *projets*, des *initiatives* et des *énoncés* proposant des moyens de surmonter ces difficultés au Canada.

On constate de plus une volonté, chez les associations provinciales d'enseignants de mathématiques, d'entretenir et de renforcer les liens créés au Forum de 2003. Le Comité pour l'avancement des mathématiques a recommandé que ces forums se tiennent tous les trois ou quatre ans. Des démarches pour l'organisation d'un prochain forum dans l'Ouest sont déjà en marche.

Math à Moscou

Nous sommes enchantés d'annoncer que le CRSNG a renouvelé son financement au programme Math à Moscou. En 2005, trois bourses ont été accordées (une de 10 000 $ et deux de 9 500 $). Grâce à ces bourses, trois étudiants du Canada inscrits à un programme de mathématiques ou d'informatique ont pu suivre un semestre d'études à l'Université indépendante de Moscou. Le calibre des étudiants qui présentent une demande est absolument remarquable.

Activités en hommage à Donald Coxeter

La SMC a été partenaire de la Banff Renaissance Conference qui s'est déroulée du 31 juillet au 3 août 2005, dans le cadre des *International Bridges Conferences on Mathematical Connections*

in Art, Music and Science. La conférence de Banff était une initiative de Robert Moody et un effort concerté du PIMS, du Banff Centre, de la SMC et des Bridges Conferences. Le dernier jour de cette rencontre a été consacré à Donald Coxeter, en hommage à la vie de cet homme et aux liens qu'il a créés entre les mathématiques et l'art. Il est possible de se procurer les actes de ce congrès au Bureau de la SMC à Ottawa au coût de 25 $ (frais d'expédition compris). Pour de plus amples renseignements sur les Bridges Conferences, passez au **www.sckans.edu/~bridges**. Le site des conférences de 2005 est logé au **http://www.pims.math.ca/ RenaissanceBanff/**

Campagne de recrutement

Plusieurs lettres, signées par le président et Thomas Salisbury (président élu), soulignant les avantages de l'adhésion à la SMC, ont été envoyées aux directeurs des départements de mathématiques ou de domaines connexes de tout le pays. Un programme de fidélisation des membres, consistant notamment à communiquer avec les membres qui n'ont pas renouvelé leur adhésion par téléphone ou par courriel, a été mis en place. En outre, la possibilité de devenir membre en ligne facilite grandement la tâche de tout le monde. Les chercheurs en informatique théorique constituent notamment un bassin potentiel de nouveaux membres, puisque ces chercheurs n'ont pas de société spécialisée au Canada. Nous espérons que les conférences principales et autres sessions de nos Réunions semestrielles toucheront ce domaine dans un avenir rapproché.

Difficultés financières de la SMC

Nos activités ne cessent de croître, et nous avons atteint la limite des ressources disponibles pour les financer. Nous prévoyons donc un déficit considérable pour 2005. Le comité des finances a formé un groupe de travail chargé de revoir l'ensemble de nos activités et de suggérer des moyens d'équilibrer le budget. En outre, le conseil d'administration a approuvé, en juin dernier, la création d'un volet « collecte de fonds », dont le mandat serait de trouver des partenaires pour nos nombreuses activités. Une campagne de financement est également prévue. Cette campagne nécessitera un appui massif de nos membres – notamment sous forme de dons – et une somme de travail considérable de la part de l'exécutif et du conseil d'administration.

La Fondation philanthropique Pétrolière Impériale a renouvelé son engagement comme commanditaire en titre des camps nationaux et régionaux. La Financière Sun Life conserve pour sa part son titre de commanditaire principal de l'Olympiade mathématique du Canada. Nous avons entrepris des démarches auprès des ministères de l'Éducation provinciaux pour le financement de notre vaste gamme d'activités éducatives. De plus, la subvention du programme PromoScience du CRSNG – qui finance nos camps mathématiques – a été renouvelée pour trois ans.

Des obstacles à surmonter

La SMC a de nombreux obstacles à surmonter au cours des prochaines années. Pour équilibrer notre budget et poursuivre nos activités sans les réduire, nous avons besoin de nouvelles sources de revenus. Nous devons faire en sorte que les nouveaux professeurs embauchés par les départements adhèrent à la SMC et deviennent des bénévoles actifs au sein de notre organisme. Nous avons besoin d'eux pour accroître la visibilité des mathématiques partout au pays et pour mousser leur popularité dans nos écoles. J'aimerais demander à chacun d'entre vous de faire du recrutement actif dans votre établissement : demander notre dépliant sur les avantages de l'adhésion à la SMC en écrivant au bureau administratif à l'adresse suivante : **adhesions@smc.math.ca.**

Remerciements

Nous sommes extrêmement reconnaissants envers les bénévoles qui contribuent, d'un bout à l'autre du pays, au succès de nos activités : ceux et celles qui organisent le programme scientifique et la logistique des Réunions, qui siègent à un comité, qui organisent nos activités éducatives, qui assurent la rédaction de nos revues ou qui collaborent à nos publications. Je remercie tout particulièrement le personnel du bureau administratif, pour qui chaque nouvelle activité de la SMC amène un surcroît de travail. Je dois un merci tout particulier à Graham Wright et à Tom Salisbury pour leur aide si précieuse et leur soutien inestimable. Sans oublier un grand merci à nos nombreux partenaires, commanditaires et sympathisants.

CALL FOR SITES — *DEMANDES DE PROPOSITIONS D'EMPLACEMENTS*

Interested in hosting a CMS Meeting?
The summer and winter meeting sites are confirmed to the year 2008. The CMS Research Committee invites requests from departments interested in hosting a CMS Meeting for Winter 2008 onwards. The head of the department should write to the chair.

Êtes-vous intéressés à être l'hôte d'une réunion de la SMC?
Les lieux des réunions d'été et d'hiver sont confirmés jusqu'à l'an 2008. Le Comité de la recherche de la SMC invite les départements intéressés à tenir l'une de ces réunions en hiver 2008 ou plus tard à soumettre une proposition. Les chefs de département intéressés doivent soumettre leur propositions au président.

Dr. J.F. Jardine
Chair - CMS Research Committee
Président - Comité de recherches de la SMC
Department of Mathematics
The University of Western Ontario
London, Ontario N6A 5B7 Canada

The 2005 reports are in the language provided by the chair. All other reports appear in the April issue of the CMS Notes.
Les rapports sont livrés dans la langue de rédaction d'origine; les autres rapports paraîssent dans le numéro d'avril des Notes de la SMC.

PUBLICATIONS COMMITTEE ANNUAL REPORT

by Juris Steprans, Chair

The Publications Committee oversees many of the activities of the CMS that a bearing on the society's publications. Editorial board appointment are among the committee's chief concerns.

The editorial duties of the CMB changed hands during this year, although the appointment was made already in 2004. The editors on the CJM will be stepping down in 2006 and the search for their replacement began, but did not conclude, in 2005. However, 2005 did see changes in the list of associate editors. The terms of Freydoon Shahidi and George Elliott ended in 2005. It was decided at the Waterloo meeting that George Elliott be re-appointed and that the editorial board be expanded with the appointments of Henry Kim of the University of Toronto and Alan Dow of the University of North Carolina at Charlotte.

The terms of the editors of the *CMS Notes* also expired in 2005, but R. Dawson of Saint Mary's University and S. Swaminathan of Dalhousie University have agreed to continue their work in this position.

Peter Fillmore will continue as the editor of the book review section for the *CMS Notes*.

In 2005 the CMS entered into an agreement with AK Peters to publish a new book series. The Waterloo meeting of the Publications Committee approved the appointment of the following initial editorial board for the CMS/AK Peters series: James Arthur, Ivar Ekeland, Arvind Gupta, Barbara Keyfitz and Francois Lalonde. The CMS/Springer series continues to receive a healthy number of manuscripts for consideration and sales are good. The editor of this series for many years, Jonathan Borwein, has decided to step down and he will be replaced by his colleague at Dalhousie University, Keith Taylor.

The CMS also publishes a series of booklets known as ATOM (A Taste of Mathematics) that are designed as enrichment materials for high school students with an interest in mathematics. The editorship of this series was assumed by Bruce Shawyer of Memorial in 2005.

There were also some changes in the editorial board the CMS problems journal CRUX with Mayhem. Jeff Hooper of Acadia University will replace John Grant McLoughlin as Associate Mayhem Editor while Maria Torres of the University of Regina will take over as Problems Editor from Rick Brewster.

According to the established tradition of alternating between the Bulletin and the Journal, the G. de B. Robinson in 2005 was offered for the best article (or series of articles) in the CMB. The prize was awarded to Yu-Ru Liu for her two papers: A Generalization of the Turàn theorem, CMB (2004), Vol. 47, No. 4 and A Generalization of the Erdös-Kac theorem and its applications, CMB (2004), Vol. 47, No. 4.

Several issues were considered by the committee in 2005 but not yet resolved. Among these the new pricing and bundling policy for the CMB and CMJ and the possible move to electronic submission of articles are especially worthy of note.

RESEARCH COMMITTEE ANNUAL REPORT

Finnur Larusson, Western, Chair

The two main tasks of the Research Committee are overseeing the organization of the scientific programmes of the summer and winter meetings, and selecting the recipients of the Jeffery-Williams, Krieger-Nelson, and Coxeter-James Prizes. A subcommittee of the Research Committee selects the recipient of the Doctoral Prize.

At its meeting in December 2005, the Research Committee chose Nassif Ghoussoub (UBC) as the 2007 Jeffery-Williams Prize Lecturer, Pauline van den Driessche (Victoria) as the 2007 Krieger-Nelson Prize Lecturer, and Jim Geelen (Waterloo) as the 2006 Coxeter-James Prize Lecturer. In March 2005, the Doctoral Prize Selection Committee chose Vasilisa Shramchenko (Concordia) as the recipient of the 2005 Doctoral Prize.

The 2005 Summer Meeting was held at the University of Waterloo on June 4-6, with the participation of the Canadian Society for the History and Philosophy of Mathematics. The meeting set a record both in terms of the number of delegates (540) and the number of sessions (23). The Meeting Director was Alexandru Nica and the Local Arrangements Chair was Frank Zorzitto.

The plenary speakers were:

Len Berggren, Simon Fraser, CSHPM plenary talk
Keith Devlin, Stanford
Dan Freed, Texas at Austin
Robert McCann, Toronto
Andrei Okounkov, Princeton
Gilles Pisier, Paris 6 and Texas A&M
Ken Ribet, Berkeley

The Jeffery-Williams Prize Lecture was given jointly by Edward Bierstone and Pierre Milman (Toronto), and the Krieger-Nelson Prize Lecture was given by Barbara Lee Keyfitz (Fields and Houston).

The following symposia took place at the meeting:

Automatic Sequences and Related Topics

Org.: Jean-Paul Allouche (Orsay), Jeffrey Shallit (Waterloo)

Combinatorics and Geometry

Org.: Ian Goulden (Waterloo)

Complex Variables

Org.: Thomas Bloom (Toronto), Paul Gauthier (Montreal)

Discrete and Computational Geometry
Org.: Leroy J. Dickey (Waterloo), Asia Ivic Weiss (York)

Dynamical Systems
Org.: Sue Ann Campbell (Waterloo), Yuming Chen (Wilfrid Laurier), Huaiping Zhu (York)

Exploratory Classroom Problems in Calculus
Org.: Peter Taylor (Queen's)

Functional Equations and Their Applications
Org.: Janos Aczel, Che-Tat Ng (Waterloo)

General Topology and Its Applications
Org.: E.D. Tymchatyn (Saskatoon), A. Karassev, M. Tuncali, V. Valov (Nipissing)

Geometric Topology
Org.: Hans Boden (McMaster), Doug Park, Mainak Poddar (Waterloo)

History and Philosophy of Mathematics (CSHPM Session)
Org.: Duncan Melville (St. Lawrence)

History of Mathematics from Medieval Islam to Renaissance Europe (CSHPM Session)
Org.: Rob Bradley (Adelphi), Glen van Brummelen (Bennington College)

Invariant Theory and Differential Geometry
Org.: Ray MacLenaghan (Waterloo), Roman Smirnov (Dalhousie)

L-Functions and Algebraic Curves
Org.: Yu-Ru Liu, David McKinnon, Michael Rubinstein (Waterloo)

Mathematical Aspects of Quantum Information
Org.: Daniel Gottesman (Perimeter), Achim Kempf (Waterloo), David Kribs (Guelph), Mike Mosca (Waterloo)

Mathematics from Ancient to Modern Times
Org.: Richard O'Lander, Ronald Sklar (St. John's)

Mathematics of Actuarial Finance
Org.: Tom Salisbury (York, Fields)

Mathematics of Computer Algebra and Analysis
Org.: Keith Geddes, Mark Giesbrecht, George Labahn, Arne Storjohann (Waterloo)

Nonlinear Partial Differential Equations
Org.: Robert McCann (Toronto), Walter Craig (McMaster), Catherine Sulem (Toronto)

Operator Algebras, Operator Spaces and Harmonic Analysis
Org.: Ken Davidson, Brian Forrest (Waterloo)

Random Graphs and Their Applications
Org.: Anthony Bonato (Wilfrid Laurier), Penny Haxell, Nicholas Wormald (Waterloo)

Representation Theory
Org.: Wentang Kuo (Waterloo)

String Theory and Integrable Systems
Org.: Lisa Jeffrey (Toronto), Boris Khesin (Toronto), Rob Myers (Perimeter)

Contributed Papers Session
Org.: Peter Hoffman (Waterloo)

The **2005 winter meeting** was hosted by the University of Victoria and held at the Victoria Conference Centre on December 10-12. There were 398 registered delegates and 15 sessions. The Meeting Director was Ahmed Sourour and the Local Arrangements Chair was David Leeming.

The plenary speakers were:
Robert Guralnick, Southern California
Uffe Haagerup, South Denmark
Bryna Kra, Northwestern
Andrew Majda, Courant
Oded Schramm, Microsoft

The Coxeter-James Prize Lecture was given by Robert McCann (Toronto) and the Doctoral Prize Lecture was given by Vasilisa Shramchenko (Concordia and Max Planck, Bonn).

The following symposia took place at the meeting:

Applied Partial Differential Equations
Org.: Anne Bourlioux (Montreal), Reinhard Illner, Boualem Khouider (Victoria)

Combinatorics
Org.: Peter Dukes, Frank Ruskey (Victoria)

Discrete and Convex Geometry
Org.: Karoly Bezdek (Calgary), Jozsef Solymosi (UBC)

Ergodic Theory
Org.: Christopher Bose (Victoria), Andres del Junco (Toronto)

Graph Theory
Org.: Jing Huang, Kieka Mynhardt, Wendy Myrvold (Victoria)

History of Mathematics
Org.: Len Berggren (SFU)

Life Beyond Calculus
Org.: Malgorzata Dubiel, Veselin Jungic (SFU)

Mathematics Inspired by Biological Models
Org.: Fred Brauer (UBC), Pauline van den Driessche (Victoria)

Matrix Analysis
Org.: Man-Duen Choi (Toronto), Douglas Farenick (Regina)

Nonlinear Analysis
Org.: Martial Agueh (Victoria), Ivar Ekeland (PIMS), Robert McCann (Toronto)

Operator Algebras
Org.: Marcelo Laca, John Phillips (Victoria)

Probability
Org.: Martin Barlow, Edwin Pekins (UBC)

Topology
Org.: Dale Rolfsen (UBC)

Variational Analysis and Optimization
Org.: Jiming Peng (MacMaster), Jane Ye (Victoria)

Contributed Papers Session
Org.: C. Robert Miers (Victoria)

CMS Excellence in Teaching Award

for post-secondary undergraduate teaching in Mathematics

Prix d'exellence en enseignement de la SMC

pour l'enseignement collégial et de premier cycle universitaire en mathématiques

Recognizing sustained and distinguished contributions in teaching. Full-time university, college, two-year college, or CEGEP teachers in Canada with at least five years teaching experience at their current institution can be nominated.

For details regarding nomination procedure, please visit `www.cms.math.ca/prizes` or `http://hed.nelson.com`

Deadline for nomination is: November 15

Ce prix récompense des contributions exceptionnelles et soutenues en enseignement. Il s'addresse aux professeures et professeurs d'université, de collège ou de cégep au Canada ayant au moins cinq ans d'expérience dans leur institution présente.

Pour les détails sur la procédure de mise en nomination voir `www.cms.math.ca/prizes` ou `http://hed.nelson.com`

Date limite pour soumettre une candidature : 15 novembre

Nelson & Brooks/Cole, Thomson Businesses are proud sponsors of this award.

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CONTRIBUTIONS TO DISCRETE MATHEMATICS
A NEW ACADEMIC E-JOURNAL, FREE FOR ALL `http://cdm.math.ca/`

About the journal

Contributions to Discrete Mathematics is a refereed e-journal dedicated to publishing significant works in a timely manner. Based at the University of Calgary, CDM is free for both authors and readers. We publish research articles in areas such as combinatorics and graph theory, discrete and computational geometry, discrete optimization and operations research, theoretical computer science, and coding and communication theory.

Call for papers

We invite authors to submit original, unpublished research for peer review. We also welcome survey articles in the scope of the journal. More information about the submission procedures can be found on our website, at `http://cdm.math.ca`.

Honorary Editor-in-Chief: John H. Conway
Editors-in-Chief: Karoly Bezdek, Norbert Sauer, Hugh Williams
Managing Editor: Michael Lamoureux

Articles concerning the following topics are especially encouraged:

Mathematical logic and universal algebra (03B, 03C, 08)
Applications of logic to algebra and computer science (03B, 03D, 03G)
Set theory (03E)
Designs (05B, 51E)
Sphere packings, coverings and arrangements (05B, 52C)
Geometric and algebraic combinatorics (05E)
Partially ordered sets and lattices (06A, 06B)
Diophantine approximation (11J)
Cryptography, especially algebraic and number theoretic methods (11T, 14G)
Computational number theory (11Y)
Linear and nonlinear equations in matrices and operators (15A, 47A, 47J)
Discrete geometry including the theory of polytopes and rigidity (32F, 52B, 52C)
Operator theory with discrete aspects (46N, 47A)
Combinatorial and finite geometry (51D, 51E)
Computational geometry including computational convexity (52B, 65D)

CMS Summer 2006 Meeting	CMS Winter 2006 Meeting	CMS/MITACS Summer 2007 Meeting	CMS Winter 2007 Meeting
Host: University of Calgary June 3 - 5, 2006 Westin Hotel, Calgary	Host: University of Toronto December 9 - 11, 2006 Sheraton Centre Toronto	Host: University of Manitoba June 2007 Winnipeg, Manitoba	Host: University of Western Ontario December 8 - 10, 2007 London, Ontario

HALTON-PEEL REGIONAL DATA FAIR

The Canadian Mathematical Society was pleased to support the annual Halton-Peel Regional Data Fair that was held on March 3, 2006 at Sheridan College in Oakville. The Society wishes to thank Jock Mackay of Waterloo University for serving as the CMS judge at this activity. The Fair attracted entries from 44 grade 12 students from 14 secondary schools and 30 Grade 7/8 students from 6 schools in the Halton-Peel Region.

The purpose of the Fair was to showcase student projects that have a large Statistics component, very much along the lines of a Science Fair. Topics ranged from "Addicted to MSN Messenger" to "Population Density and Endangered Species". All projects were assessed by a panel of judges that included teachers, University and College Professors and others from the community. Prizes were provided by the sponsors, including CMS.

In Jock's note to me he stated "I was particularly impressed by the students' enthusiasm, confidence and ability to explain their projects in a public gathering. All of the senior students presented their project orally and answered questions of the judges and a discerning audience."

Harley Weston
Chair - CMS Education Committee

About The Fair

The Halton Peel Regional Data Fair is an opportunity for grade 7, 8, and 12 students to share their data management projects with other students, educators, and business professionals. The first Halton Regional Data Fair was held in 2003 at Oakville Trafalgar High School in Oakville, Ontario, and attracted students from the Halton, Hamilton, Peel, and York school boards. Founded by coordinator Amy Lin, the data fair flourished and in 2004 expanded to become the Halton Peel Regional Data Fair. The 2004 fair was hosted by Sheridan College who provided the fair with a larger, more central venue for the event.

CALL FOR PROPOSALS - 2006 ENDOWMENT GRANTS COMPETITION

The Canadian Mathematical Society is pleased to announce the 2006 Endowment Grants Competition to fund projects that contribute to the broader good of the mathematical community. The Endowment Fund is used to fund such projects and the Endowment Grants Committee (EGC) administers the distribution of the grants and adjudicates proposals for projects. Depending on the performance of the CMS Endowment Fund, the funds available for this year's competition may be less than past years.

Proposals must address the goal and statement of purpose of the Canadian Mathematical Society.

The goal of the Canadian Mathematical Society is to support the promotion and advancement of the discovery, learning, and application of mathematics. The CMS Statement of Purpose is:

1. To unify and support Canadian mathematicians through effective communication, broad membership, sponsorship of diverse activities, and partnerships with like professional societies.
2. To support mathematics research through the communication of current research to both the specialist and non-specialist, public recognition of research accomplishments and collaboration with the research institutes and granting agencies.
3. To support the advancement of mathematics education through joint projects with mathematics educators at all levels, promotion of educational advancements, and partnerships with provincial ministries of education and organizations supporting mathematics education.
4. To champion mathematics through initiatives that explain, promote and increase the general understanding of mathematics, provide extra-curricular opportunities for students, and encourage partnerships with corporate, government and not-for-profit agencies.

An applicant may be involved in only one proposal per competition as a principal applicant. Proposals must come from CMS members, or, if joint, at least one principal applicant must be a CMS member.

The EGC will consider funding proposals for a maximum of three years. However, multi-year proposals must be funded from the funds available to the EGC in the year of application. The EGC will consider funding proposals to a maximum of $5,000 per year.

The EGC committee tends to favour proposals where CMS funds can be leveraged or where proposals have no other natural funding body to which to apply.

If it is anticipated that a proposal will generate something of lasting financial value, proposers must indicate that this is the case and declare their intent with respect to that value.

Application process. Application forms and templates as well as advice and directions are available at the CMS website **www.cms.math.ca/Grants/EGC.** Proposals must be received no later than September 30, 2006.

The Chair of the Endowment Grants Committee invites emails expressing interest in the grant as soon as possible

Dr. Karl Dilcher
Chair, Endowment Grants Committee
Canadian Mathematical Society
577 King Edward
Ottawa, ON K1N 6N5
chair-egc@cms.math.ca

APPEL DE PROPOSITIONS - CONCOURS DE BOURSES DU FONDS DE DOTATION 2006

La Société mathématique du Canada (SMC) est heureuse d'annoncer la tenue du Concours de bourses du fond de dotation 2006 pour le financement d'activités qui contribuent à l'essor global de la communauté mathématique. Le Comité d'attribution des bourses du fonds de dotation (CABFD) se charge d'évaluer les propositions et d'attribuer les bourses. Selon le rendement du Fonds de dotation de la SMC, le financement disponible pour le concours de cette année pourrait être inférieur à celui des années précédentes.

Les propositions doivent être conformes à l'objectif et à l'énoncé d'intention de la SMC.

La Société mathématique du Canada s'est donnée pour objectif de promouvoir et de favoriser la découverte et l'apprentissage des mathématiques, et les applications qui en découlent. Son énoncé d'intention est le suivant :

1. Regrouper et appuyer les mathématiciens canadiens en favorisant la communication et l'adhésion à grande échelle, en commanditant diverses activités et en établissant des partenariats avec des associations professionnelles semblables à la nôtre.
2. Encourager la recherche mathématique en diffusant les résultats de recherches en cours aux spécialistes et aux non-spécialistes, en faisant reconnaître publiquement les travaux de chercheurs et en collaborant avec les instituts de recherche et les organismes subventionnaires.
3. Favoriser l'apprentissage des mathématiques en réalisant des projets avec des professeurs de mathématiques de tous les niveaux, en faisant connaître les progrès dans l'enseignement et en établissant des partenariats avec les ministères de l'éducation provinciaux et les organismes voués à l'apprentissage des mathématiques.
4. Défendre les mathématiques en créant des initiatives visant à expliquer, à promouvoir et à mieux faire connaître la discipline, en organisant des activités parascolaires et en encourageant les partenariats avec les sociétés privées, les gouvernements et les organismes à but non lucratif.

Un demandeur ne peut présenter qu'une proposition par concours en tant que demandeur principal. Les propositions doivent venir de membres de la SMC. S'il s'agit d'un projet conjoint, au moins un des demandeurs principaux doit être membre de la SMC.

Le CABFD évaluera les projets qui s'étalent sur un maximum de trois ans. Les projets s'échelonnant sur plusieurs années seront toutefois financés en fonction des fonds dont disposera le Comité l'année de la demande. Le Comité se limitera aux propositions dont le financement demandé n'excède pas 5 000 $ par année.

De façon générale, le CABFD favorise les propositions où les fonds de la SMC peuvent être équilibrés ou les propositions qui ne disposent d'aucun organisme de financement naturel où postuler.

Si les demandeurs prévoient tirer une valeur financière durable du projet, ils doivent l'indiquer et expliquer leur intention envers cette valeur.

Processus de demande. Le formulaire de demande et gabarits, ainsi que conseils et instructions sont disponible au site de **la SMC `www.smc.math.ca/Grants/EGC/.f`. Les applications doivent être reçues au plus tard le 30 septembre 2006.**

Le président du comité invite les courriels décrivant votre intérêt au fond dès que possible.

Dr. Karl Dilcher
Président, Comité d'attribution des bourses du fonds de dotation
Société mathématique du Canada
577 King Edward
Ottawa, ON K1N 6N5
`chair-egc@cms.math.ca`

CMS Summer 2006 Meeting
Host: University of Calgary
Westin Hotel, Calgary, AB
June 3 - 5

The most up-to-date information for the Summer 2006 Meeting of the Canadian Mathematical Society (CMS) concerning the programme, scheduling and invited speakers list is available on our website, as well as online registration and abstract submission forms.

`www.cms.math.ca/Events/summer06/`

The Meeting registration form can also be found in the February 2006 issue of the CMS Notes.

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

Réunion d'été 2006 de la SMC
Hôte : Université de Calgary
Westin Hotel, Calgary, AB
3 - 5 juin

L'information la plus récente de la Réunion d'été 2006 de la Société mathématiques du Canada (SMC), concernant le programme, les horaires et la liste des conférenciers est disponible sur notre site web, ainsi que nos formulaires électroniques d'enregistrement et soumission de résumés.

`www.smc.math.ca/reunions/ete06/`

Le formulaire d'enregistrement est aussi publié dans les Notes de la SMC de fevrier 2006.

Les résumés de conférences paraîtront sur le site dès qu'ils seront disponibles.

Jim (Ji Ping) Liu by Wolf Holzmann

Professor Jim (Ji Ping) Liu of the Department of Mathematics and Computer Science at the University of Lethbridge died in January 2006 as a result of injuries sustained in a tragic car accident. He is survived by his wife Barong Wendy Sun and their daughter Lily and son David.

Jim was born in 1957 in Qiqihaer, China. In 1982 he graduated with a B.Sc. in Math and later a M.Sc., both from Shandong University. He met his wife in China and the family moved to Canada in 1987 when Jim started a Ph.D. at Simon Fraser University under the supervision of Brian Alspach. He graduated in 1992. After Postdoctoral work he obtained a position at the University of Lethbridge and was promoted to Associate Professor in 2001, and Professor this year.

Jim was an industrious and accomplished academic, who has left us a legacy of publications that is amazing for the relatively short period in which it was done. His research area was in graph theory. He published more than 30 papers in some top quality journals in his area. He made major contributions to his field, and to applications in computer science; for example, with coworkers he gave a complete solution of the switch-box problem. Jim held substantial research grants including NSERC grants in mathematics and in computer science. On a personal level he was a very kind and generous person, a real gentleman. He was always ready to help when called upon — NO was not a word in his vocabulary.

In summary, Dr. Liu was an excellent teacher and outstanding mathematician and his loss is a big one for the University. Jim Liu touched many lives and made them better! The University of Lethbridge will be hosting the Fourth Prairie Discrete Mathematics Workshop, August 1 - 2, 2006 in tribute to Professor Liu.

Raoul Bott by Michael Atiyah

Raoul Bott, Honorary Member of the London Mathematical Society (1976) and Hardy Lecturer (1985), died on 20 December 2005, aged 82.

He was born in Budapest and grew up in the Hungarian part of Slovakia. He emigrated in June 1939, first to England and then in July 1940 to Canada, where he went on to study Engineering at McGill University. After a PhD at the Carnegie Institute in Pittsburgh he was invited by Hermann Weyl to spend time at the Institute for Advanced Study in Princeton, after which he took a post at the University of Michigan at Ann Arbor. In 1960 he was appointed Professor at Harvard, where he remained for the rest of his working life, including a spell (together with his wife Phyllis) as Master of Dunster House.

Bott worked in the area between algebraic topology and analysis, starting with his application of Morse Theory to the topology of Lie groups. His most spectacular result was his discovery of the periodicity theorems for the stable homotopy of the classical groups. This had major repercussions and laid the foundations for the development of K-theory.

Raoul and I collaborated extensively over more than twenty years, publishing a dozen joint papers on a variety of topics, including an extension of the Lefschetz fixed point theorem to elliptic operators, lacunas for hyperbolic differential operators and moduli spaces for vector bundles over Riemann Surfaces.

He was a natural teacher who attracted a string of brilliant students, two of whom (Stephen Smale and Daniel Quillen) went on to win Fields Medals. By his research, his lectures and his personal encouragement he influenced a whole generation of geometers and topologists.

In recent years he took a keen interest in current developments in theoretical physics and devoted considerable effort to educate physicists in the relevant parts of geometry and topology.

Bott received many honours including the US National Medal of Science and the Wolf Prize. He was a member of the US National Academy of Sciences and a Foreign Member of the French Académie des Sciences.

From the London Mathematical Society Newsletter, February 2006 no. 345

NEW APPOINTMENT: Development Coordinator
NOUVEAU POSTE : Coordonnateur du développement

Mark recently joined the CMS in the newly created position of Development Coordinator. In that role, he is responsible for fundraising for the Society including review and development of opportunities for major gifts, corporate sponsorships, annual giving and planned giving.

Mark Bowman

Before joining the CMS, Mark was an independent consultant in philanthropy and conducted donor and prospect research for the Royal Ottawa Health Care Foundation and targeted solicitation strategies for organizations such as the Perley and Rideau Veterans' Health Centre Foundation and Saint Paul University. He has also provided strategic counsel to a number of organizations regarding the development of their case for support including the Nepean Community Resource Centre and Reach Canada.

Prior to developing his practice in consultancy, Mark held progressive management positions in the public and private sectors. In the public sector, he served as consultant with Technology Partnerships Canada (TPC) and as a Financial Services Manager at Export Development Corporation (EDC). In his role at TPC, Mark reviewed and assessed terms and conditions of funding agreements for innovative hi tech projects funded by TPC. At EDC, Mark provided financial trade services to Canadian exporters and foreign buyers to facilitate export sales. In the private sector, Mark worked for several leading financial institutions in a variety of lending roles including, professional banking, commercial credit, real-estate lending and corporate finance.

An active volunteer, Mark has donated his time and effort to a number of not-for-profit organizations. He currently serves on the Board of Volunteer Ottawa and on its fundraising committee, is a member of the Education Committee of the Ottawa Chapter of the Association of Fundraising Professionals, is the Interim Coordinator of Algonquin College's Fundraising Management Program and a volunteer and former big brother with Big Brothers Big Sisters Ottawa (BBBSO). Mark was recently nominated as a "Special Friend" of BBBSO in recognition of his leadership, mentorship and volunteer commitment to the organization.

Mark holds a BA in English and an MBA from Dalhousie University.

Mark welcomes CMS members, volunteers and colleagues to contact him if you have any ideas about fundraising or would like further information on fund development matters. He can be reached at 613-562-5800 x2769, by email at **fundev@cms.math.ca** and at CMS' Executive Office at 577 King Edward, Ottawa, ON, K1N 6N5.

Mark vient de se joindre à l'équipe de la SMC à titre de coordonnateur du développement, poste créé tout récemment. À ce titre, il est chargé des activités de financement de la Société, notamment de l'examen et de l'élaboration de stratégies diverses : dons d'envergure, commandite privée, campagnes de financement annuelles et dons planifiés.

Avant d'arriver à la SMC, Mark était consultant indépendant spécialisé dans les œuvres de bienfaisance. Il a notamment procédé à la recherche de donateurs et de donateurs potentiels pour la Fondation des services de santé Royal Ottawa et établi des stratégies de sollicitation pour des organismes comme la Perley and Rideau Veterans' Health Centre Foundation et l'Université Saint-Paul. Il a également donné des conseils stratégiques à un certain nombre d'organismes pour les aider à structurer leur campagne de financement, notamment au Nepean Community Resource Centre et à Reach Canada.

Avant de devenir consultant, Mark a occupé divers postes de gestion dans les secteurs public et privé. Dans le secteur public, il a été consultant pour Partenariat technologique Canada (PTC) et il a été gestionnaire des services financiers à la Société pour l'expansion des exportations (SEE). Au service de PTC, Mark a évalué les conditions relatives aux accords de financement de projets innovateurs de haute technologie financés par PTC. À la SEE, il a fourni des services financiers aux exportateurs canadiens et aux acheteurs étrangers pour faciliter les exportations. Dans le secteur privé, Mark a travaillé pour plusieurs grandes institutions financières à divers titres (services professionnels, crédit commercial, prêt immobilier, financement des entreprises).

Bénévole actif, Mark a donné du temps et de l'énergie à plusieurs organismes sans but lucratif. En ce moment, il siège au conseil d'administration et au comité de financement de Bénévoles Ottawa, il est membre du comité d'éducation du chapitre d'Ottawa de l'Association of Fundraising Professionals, il est coordonnateur par intérim du programme de gestion des collectes de fonds du Collège Algonquin et il est bénévole pour les Grands Frères Grandes Soeurs (GFGS) d'Ottawa. Dernièrement, il a été nommé « ami spécial » par cet organisme pour son leadership, son travail de mentorat et son engagement à titre de bénévole.

Mark détient un B.A. en Anglais et une M.B.A. de l'Université Dalhousie.

Mark invite les membres, les bénévoles et les partenaires de la SMC à communiquer avec lui s'ils ont des idées de financement ou pour obtenir de plus amples renseignements sur les campagnes de financement. On peut le rejoindre au (613) 562-5800 poste 2769, par courriel à **fundev@cms.math.ca** et au bureau administratif de la SMC au 577, avenue King-Edward, Ottawa (Ontario) K1N 6N5.

CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

MAY 2006 MAI

5-10 Combinatorial and Geometric Group Theory (Vanderbilt University, Nashville, TN) **www.math.vanderbilt.ed/~msapir/cggt/cggt.html**

7-11 Category Theory and its Applications a conference in memory of Saunders Mac Lane In conjunction with the 2006 Unni Namboordiri Lectures and the Spring 2006 Midwest Topology Seminar (The University of Chicago, Chicago,IL) **www.math.uchicago.edu/~may/MACLANE/**

10-12 Workshop on Numerical, Mathematical and Modeling Analysis related to Fluid Dynamics in Hydrogen Fuel Cells held at University of Ottawa, Supported by MITACS **www.fields.utoronto.ca/programs/scientific/05-06/fuelcells/**

12-13 Ottawa-Carleton Discrete Mathematics Workshop (Carleton University, Ottawa, ON) **www.fields.utoronto.ca/programs/scientific/05-06/discrete_math/**

13-18 Analytical Methods for Diophantine Equations (Banff International Research Station, Banff, AB) **paradis@crm.umontreal.ca**

14-16 Workshop on Covering Arrays: Constructions, Applications and Generalizations (Carleton University) **www.fields.utoronto.ca/programs/scientific/05-06/covering_arrays/**

15-17 Workshop on Probabilistic Symmetries and their Applications held at the(University of Ottawa)**www.mathstat.uottawa.ca/~givanoff/workshop.htm**

15-20 Workshop on Random Walks in Random Environments(Fields Institute, Toronto, ON) **www.fields.utoronto.ca/programs/scientific/05-06/**

17-21 ASL Annual Meeting (Montreal, Quebec) **asl@vassar.edu**

23-27 Hyperbolic Geometry (Fields Institute, Toronto) **www.fields.utoronto.ca/programs/scientific/05-06/**

25-27 CASC 2006 Conference (Canadian Association of Science Centres) **www.canadiansciencecenters.ca/conferences.htm**

JUNE 2006 JUIN

1 Actuarial Research Day (University of Western Ontario, London, ON) **www.fields.utoronto.ca/programs/scientific/05-06/**

1-3 Carleton Applied Probability Workshop (Carleton University, Ottawa, ON) **www.fields.utoronto.ca/programs/scientific/05-06/applied_probability/**

3-5 **CMS Summer 2006 Meeting / Réunion d'été 2006 de la SMC Westin Hotel, Calgary AB** **www.cms.math.ca/events meetings@cms.math.ca.**

3-7 Rencontre annuelle 2006 du GCEDM/ CMESG 2006 Annual Meeting (University of Calgary, Calgary, AB)

8-11 Digital Mathematical Performance Workshop (University of Western Ontario, London, ON) **www.fields.utoronto.ca/programs/scientific/05-06/**

10-20 Mathematical Modeling of Infectious Diseases Summer School (York University, North York, ON) **www.fields.utoronto.ca/programs/scientific/05-06/**

JUNE 2006 JUIN

12-15 Journées Peter Shalen,a conference on 3-dimensional topology and its role in mathematics, on the occasion of Peter Shalen's sixtieth birthday (CRM in Montreal, Quebec) **www.crm.umontreal.ca/Shalenfest/index_e.html**

15-20 The Joint CAIMS-MITACS 2006 Annual Meeting (York University, North York, ON) **http://www.mitacs.math.ca/AC06/**

19-7 jul. Computational Number Theory and Applications to Cryptography (University of Wyoming) **http://math.uwyo.edu/RMMC/2006/rmmc06.html**

21-25 9th PIMS Graduate Industrial Math Modelling Camp (GIMMC) (Simon Fraser University, Burnaby, BC) **www.pims.math.ca/gimmc**

25-28 2006 SIAM Conference on Discrete Mathematics (Victoria, B.C.) **www.siam.org/meetings/calendar.php**

26-30 10th PIMS Industrial Problem Solving Workshop (IPSW) (Simon Fraser University, Burnaby, BC) **www.pims.math.ca/ipsw**

27-Jul 3 International Commission on Mathematical Instruction: Challenging Mathematics in and beyond the Classroom (Trondheim, Norway) **www.amt.canberra.edu/icmis16.html/, barbeau@math.utoronto.ca**

JULY 2006 JUILLET

3-14 Conference and mini-courses on Geometric Group Theory (CRM, Montreal, Québec) **www.crm.umontreal.ca/geometric06**

6-18 **International Mathematical Olympiad / Olympiade International mathématique (Ljubljana, Slovenia)** **www.cms.math.ca/Competitions www.smc.math.ca/Concours**

10-14 SIAM Annual Meeting (Boston, MA) **www.siam.org/meetings/calendar.php**

24-27 MOPTA 06 -- 6th Annual MOPTA Conference Modeling and Optimization: Theory and Applications (University of Waterloo, Waterloo, ON) **www.stats.uwaterloo.ca/stats_navigation/Mopta/index.shtml**

24-Aug 4 Computational Commutative Algebra Workshop (Fields Institute, Toronto, ON) **www.fields.utoronto.ca/programs/scientific/05-06/**

AUGUST 2006 AOÛT

2-6 Eighth IMS North American New Researchers Conference (Minneapolis,Minnesota) **galin@stat.umn.edu**

12-18 Third International Conference of Applied Mathematics (Plovdiv, Bulgaria) **http://math.uctm.edu/conference2006**

12-20 Methods of Integrable Systems in Geometry: An LMS Durham Research Symposium, Satellite to ICM 2006 (University of Durham, UK) **www.icm2006.org**

13-19 10th Prague Topological Symposium, International Conference on General Topology and its Relations to Modern Analysis and Algebra (Prague, Czech Republic) **topology-news@atlas-conferences.com**

14-16 Canadian Computational Geometry Conference (CCCG)(Queen's University, Kingston, ON) **www.fields.utoronto.ca/programs/scientific/05-06/**

16-19 Workshop on Geometric Methods in Group Theory (Carleton University, Ottawa, ON) **www.fields.utoronto.ca/programs/scientific/06-07/group_theory/**

CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

AUGUST	2006	AOÛT

16-19 Trends and Challenges in Calculus of Variations and its Applications, Satellite to ICM 2006 (UCLM, Toledo, Spain) `www.icm2006.org`

16-19 Algebraic Geometry, Satellite to ICM 2006 (Segovia, Spain) `www.icm2006.org`

22-30 **International Congress of Mathematicians (Madrid, Spain)** `www.icm2006.org`

31- Sept.5 Workshop on Geometric and Topological Combinatorics, a satellite conference of ICM 2006 (Universidad de Alcala (UAH), Alcala de Henares, Spain) `francisco.santos@unican.es`

SEPTEMBER	2006	SEPTEMBER

14-17 Conference On Routing And Location 2006 (CORAL 2006), Satellite to ICM 2006 (Puerto de la Cruz, Tenerife) `www.icm2006.org`

21-23 First Joint CMS/SMM Meeting `www.cms.math.ca`

OCTOBER	2006	OCTOBRE

2-6 Quantum Cryptography And Computing Workshop (The Fields Institute, Toronto) `www.fields.utoronto.ca/programs/scientific/06-07/crypto/quantum`

30-Nov.3 Computational challenges arising in algorithmic number theory and cryptography (the Fields Institute, Toronto) `www.fields.utoronto.ca/programs/scientific/06-07/crypto/number_theory/`

NOVEMBER	2006	NOVEMBRE

27-Dec.1 Workshop on Cryptography: Underlying Mathematics, Provability and Foundations (the Fields Institute, Toronto) `www.fields.utoronto.ca/programs/scientific/06-07/crypto/crypto_foundations/`

DECEMBER	2006	DÉCEMBRE

9-11 **CMS Winter 2006 Meeting / Réunion d'hiver 2006 de la SMC Toronto, ON** `www.cms.math.ca/events, meetings@cms.math.ca`

JANUARY	2007	JANVIER

4-7 Joint Mathematics Meetings: AMS, MAA, AWM,etc. `www.ams.math.org`

MAY	2007	MAY

20-24 The CAIMS Annual Meeting (Banff Conference Centre)

JULY	2007	JUILLET

16-20 6th International Congress on Industrial and Applied Mathematics (Zurich, Switzerland) `www.iciam07.ch`

Tarifs et horaire 2006 Rates and deadlines

Deadlines for receipt of material are as follows / Les dates limites pour la réception des annonces sont les suivantes

Issue date / date de parution	Content deadline / Date limite pour contenu
February / février	December 1 / le 1 décembre
March / mars	January 14 / le 14 janvier
April / avril	February 15 / le 15 février
May / mai	March 15 / le 15 mars
September / septembre	July 15 / le 15 juillet
October / octobre	August 15 / le 15 août
November / novembre	September 15 / le 15 septembre
December / décembre	October 14 / le 14 octobre

Net rates / tarifs nets	Institutional Members / Libraries Membres institutionnels et Bibliothèques	Corporate Members Membre Organisationel	Others/Autres
Full page / page complète	260.00	485.00	645.00
3/4 page	240.00	445.00	595.00
1/2 page	160.00	295.00	395.00
1/4 page	95.00	175.00	235.00
Back cover	325.00	615.00	815.00
Inserts	195.00	375.00	495.00

Subscription to the *CMS Notes* is included with the CMS membership. For non-CMS members, the subscription rate is $60 (CDN) for subscribers with Canadian addresses and $60 (US) for subscribers with non-Canadian addresses.

L'adhesion à la SMC comprend l'abonnement aux Notes de la SMC. Le tarif d'abonnement pour les non-membres est de 60 $ (CDN) si l'adresse de l'abonné est au Canada et de 60 $ (US) si l'adresse est à l'étranger.

If undelivered, please return to:
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