



# CMS NOTES<sup>de la</sup> SMC

## FROM THE PRESIDENT-ELECT'S DESK

**Anthony To-Ming Lau**  
*University of Alberta, Edmonton*



This is my first column as President-Elect of the Canadian Mathematical Society, and I would like to thank all of you and my colleagues for warm support. I will do my best to serve the mathematical community during the next four years. I look forward to working with President Tom Salisbury and the Executive team, our staff, and all volunteers of the mathematical society.

I would like to take this opportunity to introduce to the mathematical community a new and exciting mathematical association, PRIMA. Two years ago, on October 24-25, 2005, I was privileged to be invited to a meeting of representatives of a number of leading mathematical institutions in the Pacific Rim including Australia, China, Korea, Columbia, Mexico, Japan, Chile, New Zealand, Singapore, Hong Kong, USA, PIMS, MSRI and BIRS. A resolution was made to establish an organization to be known as the Pacific Rim Mathematical Association (PRIMA) with the mission to promote and facilitate the development of

the mathematical sciences throughout the Pacific Rim region. PRIMA is a loose association of mathematical organizations being co-ordinated by Alejandro Adem, Canada Research Chair in Topology at the University of British Columbia, and Deputy Director of PIMS. Its membership falls into three categories: institutes, departments of mathematical sciences and national math societies with initial support from MSRI and PIMS. I am excited that this will be an opportunity for the Canadian mathematical community to interact with colleagues of the Pacific Rim.

Activities of PRIMA will include: Pacific Rim Congress, summer schools for graduate students, exchange of scholars, co-advising and joint Ph.D. programs, expanded collaborative research groups, PRIMA lectures, sharing benefits of expertise among institutes and promotion of mathematics in developing countries.

On the PRIMA website [www.primath.org](http://www.primath.org) you will find a long list of events in 2007. At the present a big focus of PRIMA activity is preparing for the First PRIMA congress, July 13-17, 2009, hosted by the University of New South Wales, Sydney,

Australia. About 500 participants are expected to attend, and there will be plenary speakers, special sessions and prizes for outstanding young mathematicians. The scientific committee consists of: Rafael Benguria (Catholic University, Chile), Phil Broadbridge (Australian Mathematical Sciences Institute, Australia), Kung-Ching Chang (Peking University, China), Michael Cowling (University of New South Wales, Australia), José Antonio de la Peña (UNAM & CONACYT, Mexico), David Eisenbud [CHAIR] (UC Berkeley, USA), Ivar Ekeland (University of British Columbia, Canada), Yasha Eliashberg (Stanford University, USA), Masaki Kashiwara (RIMS, Kyoto University, Japan), Hyo Chul Myung (Korea Institute of Advanced Study, Korea), Tatiana Toro (University of Washington, USA).

In 2007, the Winter Meeting of the Canadian Mathematical Society will be hosted by the University of Western Ontario in London, Ontario, December 8-10. Also the Second Canada-France Congress will take place at UQAM in Montreal, June 1-6, 2008. I look forward to meeting many of you there.

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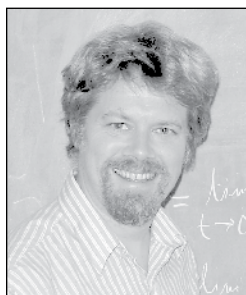
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## Some Polygonal Oddities

Here's a truly strange result, due to Martin Gardner. Compute the first several rows of Pascal's Triangle modulo 2:

```

      1
     1 1
    1 0 1
   1 1 1 1
  1 0 0 0 1
 1 1 0 0 1 1
1 0 1 0 1 0 1
1 1 1 1 1 1 1 1
1 0 0 0 0 0 0 1
1 1 0 0 0 0 0 1 1
1 0 1 0 0 0 0 1 0 1
1 1 1 1 0 0 0 1 1 1 1
1 0 0 0 1 0 0 1 0 0 0 1
1 1 0 0 1 1 0 0 1 1 0 0 1 1
1 0 1 0 1 0 1 0 1 0 1 0 1 0 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
    
```

(That's enough triangle. -Ed.)

Now read these off as binary numbers: 1, 3, 5, 15, 17, 51, 85, 255, 257, 771, 1285, 3855, 4369, 13107, 21845, 65535, ... Does this sequence look familiar? It should: these are the first few odd  $n$  such that the regular  $n$ -gon is constructible with compass and straightedge! Don't believe me; check Sloane's Handbook of Integer Sequences.

It's not obvious whether we should include 1, representing perhaps a circle with a single dot on the perimeter; but when we realize that the even-sided constructible  $n$ -gons are found by multiplying the odd numbers above by powers of 2, it is clear that we need 1 to anchor the mostly-nontrivial sequence 1,2,4,8,...

A little thought will make it clear why this is true. It may be shown (see, for instance, chapter 14 of Baragar's excellent *A Survey of Classical and Modern Geometries*) that no constructible number can be a root of a polynomial of odd degree which is irreducible over the rationals. From this, it follows (with a little work) that if the  $n$ -gon is constructible, then  $n$  has no repeated odd prime factor.

Which odd prime factors  $p$  are available to us? The complex  $p^{\text{th}}$  roots of 1 satisfy the cyclotomic polynomial  $\omega^{p-1} + \dots + \omega^2 + \omega + 1 = 0$ , of degree  $p-1$ , and this is irreducible by Eisenstein's criterion. Then  $p-1$  must be a power of 2; so  $p = 2^m + 1$  for some  $m$ . However, if  $m$  has an odd factor,  $2^m + 1$  is composite; so an odd prime factor of  $n$  must be of the form  $2^{2^r} + 1$  - a Fermat number. The first few Fermat numbers are 3,5,17,257,65537,..., and Fermat conjectured based on these that every such number was prime.

Now look back at the triangular array above. The rows  $R_{2^r}$  of the form 10...01, with  $2^r - 1$  zeros, represent (in binary) the Fermat numbers  $F_r$ . Moreover, because these strings of zeros grow so fast, each being more than twice as long as the previous one, any set of distinct Fermat numbers can be multiplied in binary without carrying. Such a multiplication is just a convolution of strings.

It follows that if  $a$  has the binary representation  $2^{r-1} + 2^{r-2} + \dots + 2^{r-i}$ , the row  $R_a$  of the triangle is the product  $F_{r-1} F_{r-2} \dots F_{r-i}$  of distinct Fermat numbers - and hence, if Fermat was right, the order of an odd constructible polygon.

But was Fermat correct? Well, 28 more Fermat numbers have now been successfully tested for primality - and Fermat struck out each time. (Some have been tested indirectly - they are known to be composite but no factor has been found.) If there are indeed no more Fermat primes, Gardner's result continues to hold up to 4294967295 (32 binary digits, all ones) - and then stops forever.

Should we expect more? Well, a well-known theorem on the density of primes tells us that in the neighborhood of  $n$ , the density of primes is about  $1/\log(n)$ . Thus, the probability that a random number selected near  $2^{2^n}$  is prime is on the order of  $2^{-n}$ . And if we select random numbers near  $2^{2^n}$  for  $n = 32, 33, 34, \dots$  the probability of getting even one prime is about 2-31. Now, of course we're always picking odd numbers, so our chances are better - about 2-30.

So, in a sense, we can say that the chance that Gardner's sequence ever finds another constructible number is one in a billion.

### NOTES DE LA SMC

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## Quelques singularités polynomiales

Voici un résultat vraiment étrange, dû à Martin Gardner. Calculez les premières rangées du triangle de Pascal modulo 2 :

```

      1
     1 1
    1 0 1
   1 1 1 1
  1 0 0 0 1
 1 1 0 0 1 1
1 0 1 0 1 0 1
1 1 1 1 1 1 1 1
1 0 0 0 0 0 0 0 1
1 1 0 0 0 0 0 0 1 1
1 0 1 0 0 0 0 0 1 0 1
1 1 1 1 0 0 0 0 1 1 1 1
1 0 0 0 1 0 0 0 1 0 0 0 1
1 1 0 0 1 1 0 0 1 1 0 0 1 1
1 0 1 0 1 0 1 0 1 0 1 0 1 0 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
    
```

Interpréter maintenant ces chiffres comme des nombres binaires : 1, 3, 5, 15, 17, 51, 85, 255, 257, 771, 1285, 3855, 4369, 13107, 21845, 65535, ... Cette suite semble-t-elle familière ? Elle devrait : ce sont les premiers entiers impairs  $n$  tels que le  $n$ -gone régulier est constructible avec un compas et une règle ! Voir le manuel de Sloane sur les suites des nombres entiers.

Il n'est pas clair si on doit inclure le 1, représentant peut-être un cercle avec un seul point sur le périmètre ; mais lorsqu'on réalise que les  $n$ -gones constructibles dont le nombre de côtés est pair sont obtenus en multipliant les nombres impairs ci-dessus par des puissances de 2, le besoin d'inclure le 1 pour compléter la suite (presque) non triviale 1,2,4,8,... devient plus clair.

Après y avoir un peu réfléchi, on peut voir pourquoi c'est vrai. On peut montrer (voir, par exemple, le chapitre 14 de l'excellent travail de Baragar *A Survey of Classical and Modern Geometries*) qu'aucun nombre constructible ne peut être une racine d'un polynôme irréductible sur les rationnels ayant un degré impair. Il s'ensuit (avec un peu de travail) que si le  $n$ -gone est constructible, alors  $n$  n'a aucun facteur impair premier multiple.

Quels facteurs premiers impairs  $p$  sont-ils à notre disposition ? Les racines  $p$ -ième complexes de l'unité satisfont le polynôme cyclotomique  $\omega^{p-1} + \dots + \omega^2 + \omega + 1 = 0$ , de degré  $p-1$ ,

qui est irréductible par le critère d'Eisenstein. Alors  $p-1$  doit être une puissance de 2 ; d'où  $p = 2^m + 1$  pour un certain  $m$ . Cependant, si  $m$  admet un facteur premier,  $2^m + 1$  est composé ; alors un facteur premier impair de  $n$  doit être de la forme  $2^{2^r} + 1$  – un nombre de Fermat. Les premiers nombres de Fermat sont 3,5,17,257,65537, .... En se basant sur ces nombres, Fermat émet sa conjecture selon laquelle un nombre de la forme  $2^{2^r} + 1$  est toujours premier.

Regarder maintenant de nouveau l'arrangement triangulaire ci-dessus. Les rangées  $R_{2^r}$  de la forme 10...01, avec  $2^r - 1$  zéros, représentent les nombres de Fermat  $F_r$  sous formes binaires. De plus, comme ces chaînes de zéros croissent si rapidement, chacune plus que deux fois plus longue que la précédente, alors dans chaque ensemble de nombres de Fermat distincts en formes binaires, on peut effectuer la multiplication sans retenue. Une telle multiplication est simplement une convolution des chaînes.

Il s'ensuit que si  $2^{(r-1)} + 2^{(r-2)} + \dots + 2^{(r-i)}$  est la représentation binaire du nombre  $a$ , alors la rangée  $R_a$  du triangle est le produit  $F_{r-1} F_{r-2} \dots F_{r-i}$  des nombres de Fermat distincts - et par conséquent, si Fermat avait raison, l'ordre d'un polygone constructible impair.

Mais Fermat avait-il raison ? 28 nouveaux nombres de Fermat sont maintenant confirmés non premiers (certains ont été examinés indirectement - ils sont connus d'être composés mais aucun facteur n'a été trouvé.) Si en effet il n'y a pas d'autres nombres de Fermat premiers, le résultat de Gardner continue à être vrai jusqu'à 4294967295 (32 chiffres binaires, tous des 1) - et puis s'arrête pour toujours.

À quoi doit-on s'attendre de plus ? Bien, un théorème bien connu sur la densité des nombres premiers nous dit que dans le voisinage de  $n$ , cette densité est environ  $1/\log(n)$ . Ainsi, la probabilité qu'un nombre aléatoire choisi près de  $2^{2^n}$  soit premier est dans l'ordre de  $2^{-n}$ , et si on choisit des nombres aléatoires près de  $2^{2^n}$  pour  $n = 32, 33, 34, \dots$  la probabilité d'obtenir même un nombre premier est proche de  $2^{-31}$ . Maintenant, comme on sélectionne toujours des nombres impairs, les chances sont meilleures – environ  $2^{-30}$ .

Ainsi, dans un sens, on peut dire que la chance que dans la suite de Gardner on trouve un autre nombre constructible est un sur milliard.

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### Have you written a book lately?

Would you like to see it reviewed in the CMS Notes? If so, please arrange to have a review copy sent to our Book Review Editor.

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Vous aimeriez une critiques littéraires de celui-ci dans les Notes de la SMC? Si oui, veuillez faire parvenir une copie au rédacteur des critiques littéraires.

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### *Knots and Links*

by Dale Rolfsen

MS Chelsea 2003 xi + 439 pp

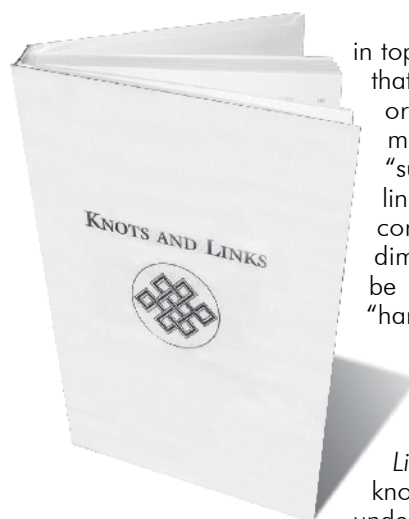
Review by Steven Boyer, UQAM

Dale Rolfsen's *Knots and Links* is a classic. First published in 1976 by Publish or Perish, Inc., it immediately became one of those books that every graduate student and researcher working in topology had on their shelf. It's a text which demands action, full of the sort of examples and exercises which serve a working mathematician throughout a career. My original copy bears witness to the abuse such a volume is subject to - decorated with marginal notes and coffee stains, and held together with tape. It occupies a privileged place at home while a more presentable copy is for office use. The sturdy nature of the new AMS-Chelsea hard cover edition is a welcome feature which should be appreciated by the next generation of topologists.

The continuing success of *Knots and Links* over the last 30 years is due in part to its great charm. The author's joy at doing this sort of mathematics is evident. His point of view is invariably visual and the fantastic wealth of illustrations form the core of the book by encapsulating its main ideas. Rolfsen has a gift for conveying the heuristic of a proof and providing enough detail to convince, without getting bogged down in details. Readers are asked to work out many points on their own. In fact, one of the pleasures of the book is that the author unselfishly assigns some of its loveliest results to exercises. Though I can't do justice to the breadth of material covered in the book in this short review, I will try to impart some feel for its subject and contents.

The knots considered in *Knots and Links* are mathematical objects which model (and generalise) the knotted ropes, strings, and shoelaces of our everyday experience. This experience tells us that the essential nature of a knotted cord survives as long as no part of it slips over one of the cord's ends. A simple device for avoiding the latter possibility is to glue the two ends together so that we are dealing with a knotted circle, and this leads us to the mathematical approach. A mathematical knot is a simple closed loop. In other words, a *knot* is a continuous path which starts and ends at the same point, and never crosses itself. More generally, a *link* is a finite union of disjoint knots. Two links are considered equivalent if one can be deformed to the other through a family of continuously varying links.

A basic problem in knot theory is that of enumeration. It is intuitively clear that there are infinitely many different knots, though no amount of play with string models can prove that there are even two. Fortunately, mathematical methods which distinguish knots abound, and many of them are found in the book under review. Appendix C of *Knots and Links* contains beautiful illustrations of some 400 different knots and links. If that was all there was to it, knot theory would be little more than a curiosity, attractive but peripheral. In fact, knots and links arise in a variety of areas of mathematics and science. This is not surprising since they represent a fundamental characteristic of the physical universe. Indeed, the initial efforts to enumerate knots came from Lord Kelvin who proposed in 1867 that atoms were knotted tubes of aether. The central role played by knots



in topology is based on the fact that any (closed, connected, orientable) 3-dimensional manifold can be obtained by "surgery" on an appropriate link in  $S^3$ . Similarly, all (closed, connected, orientable) 4-dimensional manifolds can be obtained by appropriate "handle additions" determined by a link in  $S^3$ .

Anyone who spends a little time with *Knots and Links* will discover that while knots are the protagonists and understanding their classification

and main properties the force which propels the book forward, the book's subtext is the development of the basic notions of geometric topology and related topics in algebra. Knot theory is particularly well-suited to this task since, on the one hand, its rich environment provides a non-trivial setting to explore these notions, while on the other, it is concrete enough for its fundamental objects to be readily visualized and modeled. For instance, chapter 2 of the book uses the classification problem for knots in surfaces to introduce the basic results in 2-dimensional topology. Thus the Schoenflies and annulus theorems are invoked to show that the knot theory of the plane and the 2-sphere are trivial — all knots in these surfaces can be deformed within the surface to a standard circle. This result is then coupled with covering space theory to classify the infinitely many different knot types on a torus. Along the way attentive readers learn about isotopy, mapping class groups, higher dimensional versions of the results discussed, and solve many exercises which deepen their understanding.

After this 2-dimensional warm-up, the book takes up the study of knots and links in the 3-sphere. The most basic invariant of such a knot  $K$  is its complement  $M_K = S^3 \setminus K$ . Note that the topological type of  $M_K$  does not change under knot equivalence — a deformation between two knots induces a homeomorphism (i.e. topological equivalence) between their complements. (In 1991, Cameron Gordon and John Luecke proved that the much deeper converse problem has a positive solution: knots with the homeomorphic complements are equivalent up to taking a mirror image. Hence knowing  $M_K$  is the same as knowing  $K$ !) Thus any topological invariant of  $M_K$  provides a potentially useful quantity for distinguishing knots. Chapter 4 discusses the loop and sphere theorems, two famous results of 3-dimensional topology due to Papakyriopoulos, and applies them to prove that  $M_K$  is determined to a very great extent by its fundamental group  $\pi_1(M_K)$ . For instance, the loop theorem implies that if this group is abelian, then  $K$  is equivalent to a standard circle and consequently we can deduce the non-cancellation theorem: you cannot undo a knot in a rope by tying another knot (see §4B). Chapters 6, 7, and 8 of the text explore the homology of the various cyclic covering spaces of  $M_K$ , a particularly rich source of invariants. These include the important and easily calculable Alexander polynomial of  $K$ , an invariant which is fine enough to distinguish between most of the knots depicted in Appendix C.



Dehn surgery is the subject of chapter 9. This is the operation which removes a small tube about the knot and glues it back in with a twist determined by an element of  $P^1(\mathbb{Q}) = \mathbb{Q} \cup \{\infty\}$ . Performing the  $\infty$ -Dehn surgery gives back the 3-sphere while typically, any other surgery yields another 3-manifold. For instance, for  $|p| > 1$ ,  $\frac{p}{q}$ -Dehn surgery on the trivial knot (i.e. a standard circle) yields the lens space  $L(p, q)$  (§9G). We can perform surgery simultaneously on the components of a link once they are marked with elements of  $P^1(\mathbb{Q})$ . Thus such *framed links* are shorthand notation for a 3-manifold.

Though the surgery operation goes back to work of Heegaard in the 19th century, its fundamental nature only became apparent in the early 1960s when Ray Lickorish and Andrew Wallace proved independently that any closed, connected, orientable 3-manifold can be obtained by performing surgery on some framed link. It is possible for different framed links to represent the same manifold and understanding this phenomenon through the author's *rational calculus* is the subject of the final three sections of chapter 9. Rational calculus is based on two moves which transform framed links while not changing the manifolds they represent. Among the many fascinating examples and exercises on offer, the reader is asked to use the calculus to show that  $L(p, q)$  is represented by surgery on a daisy chain of trivial knots marked by the coefficients of a continued fraction expansion

of  $pq$ . It is a theorem of Rob Kirby that any two framed links presentations of a given manifold differ by a sequence of such moves. The situation is somewhat similar to the fact that any two finite presentations of a group are related by a finite sequence of Tietze transformations, though the framed link representation carries the essence of the represented 3-manifold in a much more accessible fashion. Thus, powerful 3-manifold invariants such as the Casson invariant and the Reshetikhin-Turaev-Witten invariants can be calculated combinatorially in terms of framed links, or even defined this way. Foliations, branched covers, and fibrations are the subject of chapter 10, illustrated by examples from the world of knots and links, while the final chapter provides a sampler of high-dimensional topics.

There are no essential changes between the new edition and the original, so the reader will not find any material on two key areas: Thurston's geometric viewpoint for 3-manifolds and quantum invariants such as those based on the combinatorics of knot diagrams (e.g. the Jones polynomial and Khovanov homology). This begs the question of whether the book has continued relevance. The answer is yes. *Knots and Links* remains a fantastic introduction to knot theory and 3-manifolds, as well as a basic reference for workers in these fields. It can also be recommended to non-specialists who want to develop a feel for geometric topology. There's no better source.

## EMPLOYMENT OPPORTUNITY

### *The Brookfield Research Instructorship*

The Department of Pure Mathematics at the University of Waterloo is proud to announce the inaugural competition for the *Brookfield Research Instructorship*. This prestigious academic position is made possible through the visionary, ongoing support of Mr. J. Frank Brookfield of Waterloo, Ontario. This international competition is aimed at outstanding new mathematicians. The *Brookfield Research Instructorship* will have a duration of two years, renewable for a third year subject to mutual agreement between the candidate and the Department.

The goal of the Instructorship is to enhance research intensity in Pure Mathematics at Waterloo, to provide an opportunity for young researchers to diversify and intensify their research capacity, and to interact with students as teachers and mentors. The *Brookfield Research Instructor* will be someone who can demonstrate leadership and bring fresh ideas to our research enterprise through collaborations with departmental colleagues as well as teaching of graduate and undergraduate courses. The Department will seek to appoint a candidate who is expert in one of the areas of departmental activity: functional analysis, geometry and topology, algebra and logic, or number theory.

The first *Brookfield Research Instructor* will be appointed on July 1, 2008. The fellowship salary will be at least \$50,000 per year, and comes with a \$5,000 annual research grant. In addition to doing research, the Brookfield Research Instructor will be expected to teach five semester-long course (12 weeks) over a three year period.

The closing date for the competition is **December 15, 2007**. Interested candidates should apply to the address below by submitting their curriculum vitae plus a description of research interests and accomplishments, as well as ensure that at least three letters of reference are sent directly to this address.

**Professor Frank Zorzitto**

Chair, Department of Pure Mathematics  
University of Waterloo  
Waterloo, Ontario  
CANADA, N2L 3G1  
e-mail: fazorzit@uwaterloo.ca

We appreciate all replies to this advertisement, but only highly ranked individuals will be contacted. Waterloo is committed to employment equity and encourages applications from all qualified candidates, including aboriginal peoples, persons with disabilities, and members of visible minorities.

## Meromorphic Functions and Linear Algebra

by Olavi Nevanlinna

Fields Institute Monographs 18, AMS 2003, x + 136 pages

Review by Jaroslav Zemánek, Polish Academy of Sciences

This monograph is based on the author's courses given at the Helsinki University of Technology in the fall of 1995 and at the Fields Institute in Toronto in October 2001. Of course, the author's ideas were developing during those years at various places over the world, and the author gives an interesting mathematical, geographical and human account of his story. The topics reflect the best Scandinavian tradition in complex analysis, especially that originating from the author's Finnish family, as well as the operator theoretic aspects arising from the seminal 1962 paper by Heinz-Otto Kreiss whose many continuations have been appearing in the Scandinavian journal BIT. For more history, the reader may consult [E] and [L].

The book starts with an elementary introduction to the basics of value distribution theory of meromorphic scalar functions. The main tool here is the Rolf Nevanlinna characteristic function that counts, in an ingenious way, the growth of (the modulus of) the given meromorphic function together with its poles. Its behavior is essentially the same for the function and its inverse, which is a quantitative expression of the natural relation between the zeros and the poles of the two functions. Instead of writing down the formulas, let us quote one of the great theorems of Rolf Nevanlinna: If two functions, meromorphic in the whole complex plane, share five distinct values, then the two functions must be equal.

The author, a grand-son of Frithiof Nevanlinna (1894 – 1977), the one-year older brother of Rolf, applies this realm to linear operators. This is possible via the resolvent  $(A - z)^{-1}$  which, as an analytic function outside the spectrum of the operator  $A$ , may happen to be meromorphic (for instance, when  $A$  is a matrix). Moreover, with this operator-valued function there is an associated family of scalar-valued functions, the so-called weak resolvents

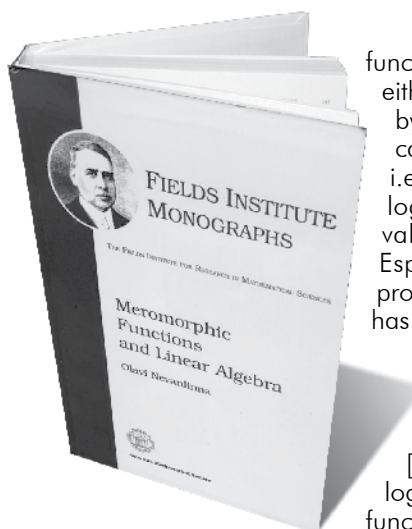
$$f[(A - z)^{-1}x],$$

where  $x$  is a fixed vector in the underlying Banach space and  $f$  is a bounded linear functional.

These weak resolvents have a better chance of being meromorphic, though not necessarily all in general. For instance, a Banach space operator (in dimension greater than one) has a non-trivial closed invariant subspace if and only if at least one of its non-trivial weak resolvents ( $f \neq 0 \neq x$ ) is meromorphic on the whole complex plane, see [NRR]. The papers [NRR] and [FNRR] contain a number of results and open problems on weak resolvents, and it might be worth looking at them from the view point of the present book, and vice versa.

It seems that a general question is the following. Which properties of the weak resolvents, valid for all  $x$  and  $f$ , imply the analogous properties of the operator resolvent  $(A - z)^{-1}$ ?

To apply the Rolf Nevanlinna theory to operator-valued functions, the author has to define the corresponding characteristic



functions. There are two ways: either replacing the modulus by the norm, or by the so-called total logarithmic size, i.e., the sum of the (positive) logarithms of the singular values of a given matrix. Especially the latter tool proved to be efficient, and it has a number of nice properties (Fourth Chapter). It was independently studied also by M. C. White in his unpublished dissertation [W]. For instance, the total logarithmic size of an analytic function is subharmonic.

The Taylor coefficients of an operator resolvent outside the spectral disc are just the powers of the operator. This makes a link between the geometric properties of an operator and analytic properties of its resolvent, important for numerical methods. There is a huge literature studying these relations, and Olavi Nevanlinna is among the leading experts. Let us recall at least his preceding book [Nev]. The present book contains a number of estimates of the powers by various analytic characteristics. For instance, if (the norms of) the powers of  $A$  are bounded by a constant, then the resolvent of  $A$  is bounded by  $\text{const}/(|z| - 1)$  outside the unit disc. The converse implication does not hold in general, but Corollary 8.2 on p. 116 says that it holds for Hilbert space operators with the Calkin norm strictly less than one (hence not necessarily compact).

Among the other elegant results, let us at least mention the bounds for the Riesz projections (pp. 100–102), the characterization of almost algebraic operators (Corollary 9.2 on p. 121), the study of eigenvalues, exceptional values, deficiencies, defective eigenvalues and defective operators (Tenth Chapter), and the theory of perturbations by low rank matrices (Sixth Chapter). For example, in the author's words, "if the spectrum of a normal matrix collapses under a low rank perturbation, there is always a compensation in terms of the loss of orthogonality of the eigenvectors." Certainly, the author succeeded in finding measures of complexity for linear operators that are stable under low rank perturbations: look back to the motivating example on pp. 9–10 treating the solution operators of second order differential equations with various boundary and initial conditions.

Applications of the Rolf Nevanlinna theory to composition operators are studied in the book [S].

Finally, it should be pointed out that the scientific and cultural tradition in the author's family goes back much further than the book shows, say, at least to his great-great-grandfather Edvard Engelbert Neovius (1823–1888) who proposed, in his large pamphlet [Ne], interesting ways of communication with the possible civilization on Mars — a popular theme of the nineteenth century in connection with the discovery of the Mars polar caps and "the channels". My experience — so far — is unfortunately limited to the polar cap in Northern Lapland where this review was completed during the polar night of December 2006.

*continued page 22*

## **Convex Functions and Their Applications: A Contemporary Approach**

by Constantin Niculescu and Lars-Erik Persson  
CMS Books in Mathematics, Canadian Math. Society  
2006, xvi + 255 pp.

Intuitively a convex set is a non-empty set which contains the segment joining any pair of its points. A real-valued function defined on an interval is convex if the chord joining any two points on the graph always lies on or above the graph, i.e., the graph never 'dents inward.' As the authors point out, we experience convexity all the time and in many ways. The most prosaic example is our upright position, which is secured as long as the vertical projection of our centre of gravity lies inside the convex envelope of our feet. Also convexity has a great impact on everyday life through numerous applications in industry, business, medicine, and art. Students learn first about convexity from the sign of the second derivative of a function in one variable and that of the Hessian matrix in several variables. They learn more about it when they study linear programming and theory of optimization.

The contemporary approach in the title of the book refers to the intense research activity and significant results obtained by several mathematicians during the last century in geometric functional analysis, mathematical economics, convex analysis and nonlinear optimization. The book contains new results based on their years of experience researching in convexity theory -- Mazur-Ulam spaces, for example, generalizing the Mazur-Ulam theorem on isometries on normed spaces.

The book provides an introduction to convex function theory by discussing convex functions and comparative convexity on intervals, convex functions on normed spaces and Choquet's theory. Topics covered include, from the single variable case to the infinite dimensional ones, various types of inequalities. Four appendices deal with background on convex sets, elementary symmetric functions, variational approach of PDEs, convex programming, and an account of the recent solution to Horn's conjecture concerning the eigenvalues of sums of Hermitian matrices. Each section ends with exercises and each chapter ends with comments covering supplementary material and historical information.

## **The Genius of Euler: Reflections on His Life and Work**

Edited by William Dunham,  
The MAA Tercentenary Euler Celebration  
MAA 2007, xvi + 309 pp.

Leonhard Euler (1707-1783) wrote voluminously on mathematics; indeed, he was the most prolific researcher in the history of the subject. There is an Euler's Theorem on almost every branch of mathematics. He wrote text books too, in addition to long journal articles, which have enjoyed popularity not only during his time but even during later times. F. Rudio, a historian of mathematics, opined, "We may safely say that the whole form of mathematical thinking was created by Euler. It is only with the greatest difficulty that one is able to follow the writings of any author immediately preceding Euler, because it was not yet known how to let the formulas speak for themselves. This art Euler was the first one to teach."

On the bicentennial of Euler's death, the MAA journal Mathematics Magazine devoted an entire issue (November 1983) on Euler and his work; it included articles on a host of topics. The present volume resurrects those papers augmenting them with articles from other sources. More than thirty authors are represented in this collection, the papers spanning a significant period, from 1872 to 2006. Thus the volume contains not only a range of topics but also a range of styles and eras. The articles are divided into two parts, each with an introductory article. Part I is about biography and background, and Part II, with title 'Mathematics', contains articles with a more technical bent that examined in detail some of Euler's mathematical achievements.

Some of the papers focus on Euler and his world, others describe a specific Eulerian achievement, and still others survey a branch of mathematics to which Euler contributed significantly. There are papers on Königsberg bridges, the 36-officers, Euler's constant, and the zeta function. Among the contributors are some of the most illustrious mathematicians and historians of the past century, including Florian Cajori, Carl Boyer, George Pólya, André Weil, and Paul Erdős. There are a few poems and a mnemonic just for fun.

## **The Early Mathematics of Leonhard Euler**

By C. Edward Sandifer,  
The MAA Tercentenary Euler Celebration  
MAA 2007, xix + 393 pp. US\$46.95

This book is intended as a mathematical biography of Euler. It is an article-by-article description, in English, of forty nine mathematical articles, arranged year-wise, that Euler completed through 1741, the year he left the Imperial Academy in St. Petersburg to join the employ of Frederick the Great in Berlin. These early pieces contain some of Euler's greatest work, the Königsberg bridge problem, his solution to the Basel problem, and his first proof of the Euler-Fermat theorem. It presents also important results that we seldom realize are due to Euler; that mixed partial derivatives are (usually) equal, our  $f(x)$  notation, and the integrating factor in differential equations.

The book shows how contributions in diverse fields are related, how number theory relates to series, which, in turn, relate to elliptic integrals and then to differential equations. There are dozens of strands in this beautiful web of mathematics. At the same time Euler is seen to grow in power and sophistication, from a young student when at 18 he published his first work on differential equations (a paper with a serious flaw) to the most celebrated mathematician and scientist of his time.

The book presents a portrait of the world's most exciting mathematics between 1725 and 1741, rich in technical detail, woven with connections within Euler's work and with the work of other mathematicians in other times, places, laced with historical context. Those with plenty of time and broad interests might want to read the book straight through and enjoy the many plots and subplots. Those with particular interests, say number theory or calculus of variations, can just read those threads. The annotated table of contents will be of help to such readers. There is also a collection of some topically related lists of papers at the end of the Preface. Some articles are marked with one, two or three stars for those with broader interests but less time; these are the ones which the editor considers most important or more interesting.



[www.careers.ualberta.ca](http://www.careers.ualberta.ca)



### Tenure Track Position, Partial Differential Equations

The Department of Mathematical and Statistical Sciences at the University of Alberta invites applications for a tenure-track position in the area of Partial Differential Equations. We primarily seek candidates at the Assistant Professor level, but exceptional candidates at a more senior level will be considered.

The successful candidate will have established accomplishments and outstanding promise in research, as well as a strong commitment to graduate and undergraduate teaching. Candidates must hold a PhD degree. We offer an excellent research environment with a normal teaching load of three courses per year. A close fit with some of the existing research being presently conducted in the Department is an asset.

Alberta is one of the leading Mathematics Departments in Canada and has strong connections with other mathematical institutes, such as the Pacific Institute for the Mathematical Sciences (PIMS), Mathematics of

Information Technology and Complex Systems (MITACS), and the Banff International Research Station (BIRS). For more information about the Department, please visit our website at <http://www.math.ualberta.ca/>.

Applications should include a curriculum vitae, a research statement, a teaching profile outlining experience and/or interests, and at least three confidential letters of reference.

The closing date for applications is November 16, 2007, or until a suitable candidate is found. Early applications are encouraged.

Interested applicants may apply to:

**Arturo Pianzola, Chair**  
**Department of Mathematical and Statistical Sciences**  
**University of Alberta**  
**Edmonton, Alberta, Canada T6G 2G1**  
**Email: [chairsec@math.ualberta.ca](mailto:chairsec@math.ualberta.ca)**

All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority. If suitable Canadian citizens and permanent residents cannot be found, other individuals will be considered. The University of Alberta hires on the basis of merit. We are committed to the principle of equity in employment. We welcome diversity and encourage applications from all qualified women and men, including persons with disabilities, members of visible minorities, and Aboriginal persons.



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### Max Wyman Assistant Professorship in Number Theory

The Department of Mathematical and Statistical Sciences at the University of Alberta invites applications for a Max Wyman Assistant Professorship in Number Theory. This is a three-year fixed-term position. The position offers an excellent research and teaching environment with a reduced teaching load (averaging two one-semester courses per year). A startup research grant is included with the position.

We are looking for a person with a PhD (or near completion), excellent research potential, and strong communication and teaching skills. Candidates are expected to develop an independent research program, and will be eligible to apply for federal research funds.

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All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority. If suitable Canadian citizens and permanent residents cannot be found, other individuals will be considered. The University of Alberta hires on the basis of merit. We are committed to the principle of equity in employment. We welcome diversity and encourage applications from all qualified women and men, including persons with disabilities, members of visible minorities, and Aboriginal persons.



## MICA: A Novel Direction in Undergraduate Mathematics Teaching

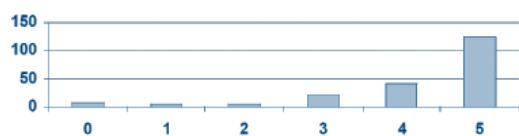
by H. Ben-El-Mechaiekh, C. Buteau, W. Ralph  
Brock University

*Pourquoi les étudiants de mathématiques à l'Université Brock dédient-ils avec entrain autant d'heures supplémentaires à leurs projets? L'honneur en revient au nouveau programme MICA (Mathematics Integrated with Computers and Applications) dont deux des principes fondamentaux sont d'encourager la créativité et l'indépendance intellectuelle et de développer les concepts mathématiques de concert avec l'usage de la technologie et des applications. La réaction des étudiants à MICA va bien au-delà des espérances du département: l'inscription a triplé, les étudiants se dévouent avec enthousiasme à leurs projets, et, selon un sondage interne, ils jugent bénéfique, avec un taux de 91.13%, l'utilisation de la technologie dans leurs cours MICA. Des exemples de projets d'étudiants se trouvent sur notre site (1).*

### Introduction

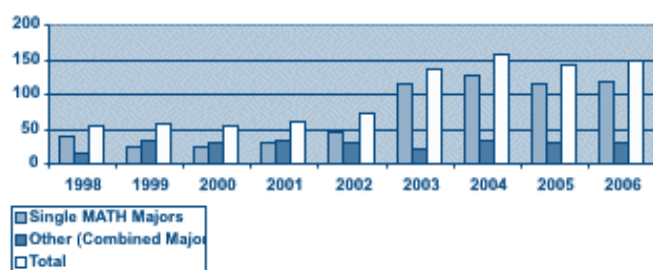
Why do mathematics students at Brock University choose to spend hours of extra time on mathematics projects? The reason is the new MICA program at Brock. MICA stands for *Mathematics Integrated with Computers and Applications*: a "hands on" approach to teaching mathematics, making extensive use of technology and remarkably increasing the level of students' engagement. In a recent survey of core MICA courses<sup>i</sup>, students overwhelmingly rated the use of technology in these courses as beneficial (91.13% of responses):

### On the Use of Technology in MICA Courses (0 = not beneficial; 5 = very beneficial)



MICA is grounded in years of pioneering the integration of technology into the curriculum spearheaded by Eric Muller (2). It was the culmination of a full year of intensive work aimed at modernizing a traditional program sliding irrevocably on a downward enrolment curve. The consensual view of a committee consisting of two-thirds of the department faculty was to embark into a rejuvenation aimed at fostering creativity and mastery of mathematical concepts while making the best possible use of modern technology (3). The results are a program that is a pleasure to teach because, in part, of the keen participation of our students as well as a remarkable increase in enrolment<sup>iii</sup>:

### Enrolment trend. MICA started in 2001.



By the mid 1980s, the Department had fully integrated Maple (4) into its large enrolment service Calculus course (5). The following decade saw the extension of the integration of Computer Mathematical Systems and Statistical Analysis Systems to other courses and programs (5,6). The MICA reform consisted in introducing three core MICA courses (a total of 2.5 credits) and revising "traditional" courses in light of the MICA principles (3) (for example, technologies such as Maple, *Journey Through Calculus* (7), *Geometer's SketchPad* (8), and SAS (9) were fully imbedded into Calculus, Linear Algebra, ODE's, Optimization, Cryptography, Statistics, etc...). In the core MICA courses, students explore, model and program (in *Visual Basic.NET* (10), Maple, or C++ (11)) mathematical concepts.

MICA offers four streams (Pure Mathematics, Applied and Computational Mathematics, Mathematics Education, Statistics) providing ample opportunity to prepare for pure/applied graduate studies with a choice of more theoretical/applied courses or a teaching career<sup>iii</sup>, yet also recognizing the blunt reality that for many, a B.Sc. in Mathematics is a terminal degree. Our graduates have been given the additional computational/modeling/simulation perspective; a clear advantage corroborated by the very positive feedback we regularly receive from supervisors and employers of our former students. Every year, a number of our students are accepted in outstanding graduate programs with funding from NSERC or OGS.

### Why Use Computers in Mathematics Teaching?

Exploration in mathematics is severely limited by the use of purely analytical tools. The tight choreography of traditional programs around problems solvable "by hand" inevitably imposes a "canned" and regimented approach.

The importance and difficulty of creating relevant, friendly, yet challenging computer labs (and assignments) cannot be overstated. The development of technology based course materials requires insight and experience. Specific guidelines summarizing some of our experience designing effective labs can be found at (12).

Technology offsets the rigidity of a traditional program by providing an endless supply of problems having both analytic and computational aspects. Many of the final projects by first year MICA students are original investigations of problems of their own invention. For example, two first year students developed an unusual novel algorithm for generating Pythagorean triples. They wrote a computer program to test their conjecture and succeeded in verifying the first few cases algebraically. It was particularly gratifying to see their motivation and dedication driven more by the thrill of the discovery rather than the project's grade.

As noted, technology enables students' engagement into a new level of creative discovery; it also plays a role in preparing students for new concepts. In a recent second year MICA lab, students were writing programs aimed at preparing them for the statement of the Central Limit Theorem. When performing sums of a strongly skewed random variable, many asked with some amazement why the curve always drifted into a symmetric shape. These same students would shortly be exposed to the full treatment of the theorem, including proof, in the statistics class. But they are already interested in the result and have experienced this wonderful phenomenon using computer programs they

entirely wrote. In short, *they have experienced a situation where they naturally raised the question before being shown the result.* This principle is fundamental to the MICA philosophy.

The first MICA cohort students were given a half course in Java (13) prior to the first MICA course. Disaster was narrowly averted: students found the language's syntax so formidable that it overwhelmed the mathematical content – the *entry fee* was too great. This forced us to simplify the content enormously. The initial programming half course was dropped the following year, in favor of a quick introduction to Visual Basic.Net within the first MICA course. Students essentially taught themselves the language by working, in early labs, through user-friendly step-by-step tutorials. The result was a huge success. Within three weeks, the vast majority of students picked up the language and graphics and proceeded to meet the course's mathematical challenges discussed below.

## The Flavor of the First Year MICA Course

MICA is built around a sequence of unique new courses emphasizing creative investigation and presentation of mathematics using computers, and in which the MICA principle of encouraging intellectual independence is fully integrated (14). The first year half-course (Winter term) is compulsory for MICA majors as well as Concurrent Education students; the presence of the latter audience justifying the strong emphasis on communication. The course meets weekly for two hours of lectures and two hours in a computer lab.

In the first part of the course, students are exposed to at least two areas of mathematics suitable for investigations and the raising of sensible conjectures that can be tested by writing programs. Examples of such starting points, accessible to students, are: the Collatz Conjecture and Prime Numbers. The class is divided into small groups and asked to raise any interesting questions about those two topics. For this session to work well, the tone has to be absolutely nonjudgmental and all speculations equally welcome. Conjectures are written on the board and we discuss the feasibility of testing them with our current level of programming skills. Each student is then asked to make his/her own unique conjecture and write a program to test it. The submitted project consists of a functioning program and a complete written report on their conjecture and findings. The program's interface is expected to be self-explanatory, visually attractive and user-friendly.

It is remarkable that for most students, this is the first opportunity in their entire intellectual life when they are asked to raise a mathematical question. Their "stiffness" at the beginning of this process is evident. But after a while, conjectures start popping up quickly and shows that students can raise interesting questions when given the chance.

The second part of the course has a very specific goal: creating a functioning encoding and decoding program based on RSA encryption useable by "spies" in the field. Students are walked through the theory of modular arithmetic, g.c.d. Euclid's algorithm, the group of integers modulo  $n$ , and Fermat's little theorem. They write programs that encapsulate each topic, in preparation for the theory and coding of the full RSA algorithm. An aim of this section is to give our students a concrete introduction to abstract algebra and number theory.

The last part of the course deals with dynamical systems. The logistic equation is covered and students write programs

exhibiting the cobweb diagram and out-putting numerical data. Once students' programs are ready, the lectures are given right in the lab so that the students can instantly use their own programs to verify the theory being developed on the board. It is a very exciting way to teach this material.

The centerpiece of this first half course is the student's final project. Students work in pairs or individually to create and test a conjecture of their own devising or, for the Mathematics Education students, to create a Learning Object to teach some aspect of mathematics. The results generally exceed our expectations. Students become very engaged in this work and the final projects are often elaborate, fascinating and a pleasure to mark. See (1) for a sample of online MICA I - III student projects.

## MICA in Upper Years

MICA II - III continue building students' experience in facing complex situations not always clearly defined; working with problems that do not have unique solutions; and programming in environments that require precision. MICA courses exemplify how technology can build bridges across mathematics subject areas (3).

Students in the second year course (full year) write programs to investigate a wide variety of mathematical models of diverse types including, for example, discrete and continuous dynamical systems, stochastic models, Markov chains, empirical models, and queuing models. In addition to VisualBasic.Net, they make extensive use of Maple for the necessary analytical calculations. MICA II Students work on two main original projects for which, again, they decide on a topic.

Using the programming environments Maple and also C++ (on UNIX) because of its prevalence in research or industrial environments, the third year course (also full year) emphasizes the investigation of PDE's (such as heat flow and wave propagation) arising in applied settings and reinforces the theoretical courses in that area. Both symbolic and numerical computations of solutions are studied. For example, students work on improving or extending MAPLETs (4) for the animation of solutions to particular PDE's and exhibiting aspects of Fourier series theory. These MAPLETs are also used to explore issues such as approximation and convergence, including a detailed statistical analysis of error behavior of Fourier series. A number of such projects were successfully presented at the international Maple Conferences (4) (summers of 2005 and 2006), rubbing shoulders with presentations by researchers and expert developers of Maple applications.

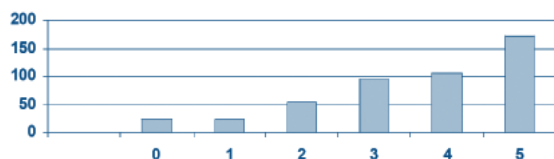
## Students' Response to the MICA Program

In March 2006 we surveyed <sup>IV</sup> students in MICA core courses on different aspects of the program, such as their appreciation of technology in mathematics courses, their learning experience, as well as their background, career goals, learning style, etc...

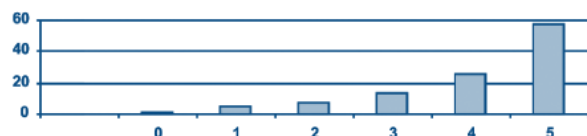
Students overall rated the use of technology in their mathematics courses as positively beneficial (77.74% of responses; 79.36% when restricted to mathematics majors).

More striking is the opinion of students considering future mathematics graduate studies: a whopping 88.18% of positive responses with a significant 51.82% top rating as "very beneficial".

## On the Use of Technology in all Courses



## On the Use of Technology for Students Considering Graduate Studies



A significant 84.71% of responders describe their students' experience in the Department of Mathematics as positively satisfactory; a figure of comfort and pride for our faculty<sup>v</sup>. Finally it is interesting to note that 74.4% of responses from future mathematics teachers rate their learning experience as useful for their future teaching career - a very strong figure for a pedagogically savvy audience known for its critical approach to technology.

## Concluding Remarks

The MICA program uses technology not only to verify and reinforce the learning of theoretical ideas but also to allow students to explore applications that are well outside the usual boundaries of a traditional mathematics program. The act of writing a computer program promotes learning because it puts the student in a feedback loop where they are constantly checking to see if the output from their program agrees with the theoretically predicted values. Students quickly discover that it is virtually impossible to write such a program without first understanding its mathematical content. In this way, students are pushed past a cursory understanding of the material to a new level of mastery. Finally, it should be noted that there is something very personal about writing programs. Our students take considerable pride in writing robust programs with user-friendly interfaces. Their level of engagement and enthusiasm for this new program has made all of the effort spent in its creation entirely worthwhile.

- (1) URL: [www.brocku.ca/mathematics/studentprojects](http://www.brocku.ca/mathematics/studentprojects)
- (2) Muller, E. (2001): *Reflections on the sustained use of technology in undergraduate mathematics education, in The Teaching and Learning of Mathematics at University Level*, D. Holton et al (Ed.), Kluwer Academic Publishers.
- (3) Brock Teaching (2001): URL: [www.brocku.ca/ctl/pdf/Brock\\_Teaching\\_1.pdf](http://www.brocku.ca/ctl/pdf/Brock_Teaching_1.pdf)
- (4) Maple, Maplesoft, URL: [www.maplesoft.com](http://www.maplesoft.com)
- (5) Auer, J., W., Jenkyns, T., A., Laywine, C., F., Mayberry, J., P., and Muller, E., R., (1982): *Motivating non-mathematics majors through discipline-oriented problems and individualized data for each student*. Int. J. Math. Educ.Sci. Technol., 13, 221.
- (6) Muller, E., R., (1991): *Symbolic mathematics and statistics software use in calculus and statistics education* ZDM 91/5 (1991), 192.

- (7) Ralph, B. (1999): *Journey Through Calculus*, Brookes/Cole
- (8) Geometer's SketchPad, URL: [www.keypress.com/sketchpad/](http://www.keypress.com/sketchpad/)
- (9) SAS, URL: [www.sas.com/](http://www.sas.com/)
- (10) VisualBasic.NET, Visual Basic, URL: <http://msdn.microsoft.com/vbasic/>
- (11) C++, URL: [www.cplusplus.com/](http://www.cplusplus.com/)
- (12) Pead, D., Ralph, B., Muller, E., (2007) *Uses of technology in mathematical modelling in "Modelling and Applications in Mathematics Education"*, Blum W. et al (Ed.), Kluwer Academic Publishers.
- (13) JAVA, URL: <http://java.net/>
- (14) Buteau, C. and E. Muller (2006): *Evolving Technologies Integrated Into Undergraduate Mathematics Education*, Proceedings for the International Commission on Mathematics Instruction Study 17: *Digital Technologies and Mathematics Teaching and Learning*.

<sup>i</sup> The survey is part of an internal assessment of the MICA program coinciding with the graduation of the first cohort. A total of 347 students were polled.

<sup>ii</sup> First year enrolment did not revert back to pre-double cohort (2003) levels. It remained strong due to a vigorous campaign of promotion of the program.

<sup>iii</sup> The formation of future teachers is a cornerstone of the Department of Mathematics' mission at Brock. This is reflected by the development of numerous programs or courses for all levels of school teaching. Appropriate technologies such as Geometer's SketchPad (7) and other Ministry of Education licensed programs are used in appropriate courses.

<sup>iv</sup> Heartfelt thanks to Pina McDonnell, Jimmy Au, and Jodie Wallis for processing the survey and compiling the results.

<sup>v</sup> Supporting the principles and the delivery of MICA has been a determining factor in our recent searches for new faculty.

## NEWS FROM DEPARTMENTS NOUVELLES DU DÉPARTEMENT

### Simon Fraser University, Burnaby, BC

**Promotions:** Veselin Jungic (Senior Lecturer, June 2007); Petr Lisonek (Associate Professor with tenure, June 2007); Ladislav Stacho (Associate Professor, June 2007); Jonathan Jebwab (Tenured, June 2007); John Stockie (Tenured, June 2007).

**Death:** Steve Thomason (Professor Emeritus April 4, 2007).

**Awards/Distinctions:** (nine-month-von Humboldt Foundation Fellowship at the Fraunhofer Institut für Techno- und Wirtschaftsmathematik in Kaiserslautern); Michael Monagan (2006-2007 Simon Fraser University Faculty of Science Excellence in Teaching Award).

**Visitors:** Keith Geddes (Canada, Computer Algebra, Sept. 2006 - June 2007); Keehong Song (South Korea, Computer Algebra, May 2007 - Feb. 2008)



[www.careers.ualberta.ca](http://www.careers.ualberta.ca)

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## Tenure Track Position, Geometrical Functional Analysis

The Department of Mathematical and Statistical Sciences at the University of Alberta invites applications for a tenure-track position in the area of Geometrical Functional Analysis. We primarily seek candidates at the Assistant Professor level, but exceptional candidates at a more senior level will be considered.

The successful candidate will have established accomplishments and outstanding promise in research, as well as a strong commitment to graduate and undergraduate teaching. Candidates must hold a PhD degree. We offer an excellent research environment with a normal teaching load of three courses per year. A fit with some of the existing research being presently conducted in the Department is an asset. For more information about the Department, please visit our website at <http://www.math.ualberta.ca/>.

We are looking for specialists in any of the areas of geometric functional analysis including asymptotic theory of normed spaces and high-dimensional convex geometry, related probabilistic methods, geometric inequalities and concentration inequalities, and related discrete mathematics aspects. Current research strengths in the analysis group of the Department include asymptotic geometric

analysis, abstract harmonic analysis, Banach spaces, Banach algebras and Banach lattices, operator theory, approximation theory, Fourier and wavelet analysis.

Alberta is one of the leading Mathematics Departments in Canada and has strong connections with other mathematical institutes, such as the Pacific Institute for the Mathematical Sciences (PIMS), Mathematics of Information Technology and Complex Systems (MITACS), and the Banff International Research Station (BIRS).

Applications should include a curriculum vitae, a research statement, a teaching profile outlining experience and/or interests, and at least three confidential letters of reference.

The closing date for applications is November 16, 2007, or until a suitable candidate is found. Early applications are encouraged.

Interested applicants may apply to:

**Arturo Pianzola, Chair**  
**Department of Mathematical and Statistical Sciences**  
**University of Alberta**  
**Edmonton, Alberta, Canada T6G 2G1**  
**Email: [chairsec@math.ualberta.ca](mailto:chairsec@math.ualberta.ca)**

All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority. If suitable Canadian citizens and permanent residents cannot be found, other individuals will be considered. The University of Alberta hires on the basis of merit. We are committed to the principle of equity in employment. We welcome diversity and encourage applications from all qualified women and men, including persons with disabilities, members of visible minorities, and Aboriginal persons.





[www.careers.ualberta.ca](http://www.careers.ualberta.ca)

### Tenure Track Position, Mathematical Biology

The Department of Mathematical and Statistical Sciences at the University of Alberta invites applications for a tenure track position in the area of Mathematical Biology. We primarily seek candidates at the Assistant Professor level, but exceptional candidates at a more senior level will be considered.

We seek an individual who will fit into our applied mathematics program (dynamical systems, differential equations, numerical methods, fluid dynamics, and probability), and who complements the Department's existing expertise in the mathematical modeling of cell biology, ecology, epidemiology, and physiology. Candidates must have a PhD degree in Mathematics or cognate discipline, an excellent research record in Mathematical Biology, strong communication and teaching skills, and leadership potential. Postdoctoral experience is an asset.

The successful candidate will develop an independent research program, supervise graduate students, and teach at both the graduate and undergraduate levels. We offer an excellent research environment with a normal teaching load of three

courses per year. For more information about the Department, please visit our website at <http://www.math.ualberta.ca/>.

Candidates have the opportunity to join the Centre for Mathematical Biology and participate in its activities. For more information about the Centre for Mathematical Biology, see [www.math.ualberta.ca/~mathbio](http://www.math.ualberta.ca/~mathbio).

Applications should include a curriculum vitae, a research statement, a teaching profile outlining experience and/or interests, and at least three confidential letters of reference.

The closing date for applications is November 16, 2007, or until a suitable candidate is found. Early applications are encouraged.

Interested applicants may apply to:

**Arturo Pianzola, Chair**  
**Department of Mathematical and Statistical Sciences**  
**University of Alberta**  
**Edmonton, Alberta, Canada T6G 2G1**  
**Email: [chairsec@math.ualberta.ca](mailto:chairsec@math.ualberta.ca)**

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### CMS Excellence in Teaching Award

for post-secondary undergraduate teaching in Mathematics

### Prix d'excellence 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](http://www.cms.math.ca/prizes)

or

<http://hed.nelson.com>

**Deadline for nomination:**  
**November 15, 2007**



Ce prix récompense des contributions exceptionnelles et soutenues en enseignement. Il s'adresse aux professeurs 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](http://www.cms.math.ca/prizes)

ou

<http://hed.nelson.com>

**Date limite pour soumettre une**  
**candidature : 15 novembre 2007**

Thomson Nelson is a  
proud sponsor of this award.

Thomson Nelson est fier  
de commanditer ce prix.

## EMPLOYMENT OPPORTUNITIES

### University of Victoria Department of Mathematics and Statistics

The Department of Mathematics and Statistics at the University of Victoria invites applications for a tenure-track position in the area of Applied Mathematics, at the Assistant Professor level, to commence on 1 July, 2008.

Applicants must have a Ph.D. in Applied Mathematics or a related discipline, and have an outstanding research record. Excellence, or the demonstrated potential for excellence, in teaching mathematics is required. The successful applicant must be able to interact in a research capacity with the Applied Mathematics Group and other interdisciplinary groups throughout the university. S/he must be able to supervise undergraduate students, graduate students and post-docs, and be prepared to be involved with activities of the Department.

We are interested in candidates whose main areas of research are one of the following: Applied Dynamical Systems, Differential Equations, Numerical Analysis and Scientific Computing, Optimization and Operations Research, and Stochastic Modelling.

Information about the Department, including descriptions of courses offered and research areas of the Applied Mathematics Group, can be found at the website: <http://www.math.uvic.ca/>

A completed application consists of a curriculum vitae, a teaching dossier or equivalent documentation that outlines teaching experience and effectiveness, and three confidential letters of reference. These may be submitted online at [www.mathjobs.org](http://www.mathjobs.org) (preferred), or by regular mail to:

**Chair**  
Department of Mathematics and Statistics  
University of Victoria  
PO Box 3045 STN CSC  
Victoria, B.C. V8W 3P4  
CANADA

**Telephone: (250) 721-7436 FAX: (250) 721-8962**

**E-mail: [aplcomp@math.uvic.ca](mailto:aplcomp@math.uvic.ca)**

The closing date for applications is  
**December 15, 2007.**

The University of Victoria is an equity employer and encourages applications from women, persons with disabilities, visible minorities, Aboriginal Peoples, people of all sexual orientations and genders, and others who may contribute to the further diversification of the University.

All qualified candidates are encouraged to apply; however, in accordance with Canadian immigration requirements, Canadians and permanent residents will be given priority.

### University of Victoria Department of Mathematics and Statistics

The Department of Mathematics and Statistics at the University of Victoria invites applications for a tenure-track position in the area of Financial Mathematics, at the Assistant Professor level, to commence on 1 July, 2008.

Applicants must have a Ph.D. in Financial Mathematics, Actuarial Science, Stochastic Financial Modelling, or a related discipline, and have an outstanding research record. Excellence, or the demonstrated potential for excellence, in undergraduate and graduate teaching is required. The successful applicant must be able to interact in a research capacity with other members of Department and other interdisciplinary groups throughout the university. S/he must be able to supervise undergraduate students, graduate students and post-docs in Financial Mathematics, Actuarial Science or Stochastic Financial Modelling and be prepared to be involved with activities of the Department.

Information about the Department, including descriptions of courses offered and research areas, can be found at the website: <http://www.math.uvic.ca/>

A completed application consists of a curriculum vitae, a teaching dossier or equivalent documentation that outlines teaching experience and effectiveness, and three confidential letters of reference. These may be submitted online at [www.mathjobs.org](http://www.mathjobs.org) (preferred), or by regular mail to:

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**E-mail: [aplcomp@math.uvic.ca](mailto:aplcomp@math.uvic.ca)**

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All qualified candidates are encouraged to apply; however, in accordance with Canadian immigration requirements, Canadians and permanent residents will be given priority.

## Call for Sessions – CMS Winter 2008 Meeting Appel de sessions – Réunion d'hiver 2008 de la SMC

Additional self-supported sessions play an important role in the success of our meetings. We welcome and invite proposals for self-supported sessions for this meeting (December 13-15, 2008) in Ottawa, Ontario. Proposals should include a brief description of the focus and purpose of the session, the expected number of the talks, as well as the organizer's name, complete address, telephone number, e-mail address, etc. These additional sessions will be incorporated with the other sessions in time blocks allocated by the Meeting Director. All sessions will be advertised in the CMS Notes, on the web sites and, if possible, in the Notices of the AMS and in publications of other societies. Speakers in these additional sessions will be requested to submit abstracts which will be published on the web site and in the meeting programme. Those wishing to organize a session should send a proposal to the Meeting Director by the deadline below.

Les sessions complémentaires autonomes jouent un rôle important dans le succès de nos réunions. Nous vous invitons à proposer des sessions autonomes pour ce congrès qui se tiendra à Ottawa, Ontario, du 13 au 15 décembre 2007. Votre proposition doit inclure une brève description de l'orientation et des objectifs de la session, le nombre de communications prévues et leur durée, ainsi que le nom, l'adresse complète, le numéro de téléphone, l'adresse courriel et les autres coordonnées de l'organisateur. Ces sessions complémentaires seront intégrées aux autres sessions du programme, dans des cases horaires prévues à cet effet par le directeur de la Réunion. Toutes les sessions seront annoncées dans les Notes de la SMC, sur le site Web et, si possible, dans les Notices de l'AMS et les publications d'autres sociétés. Les conférenciers de ces sessions complémentaires devront présenter un résumé qui sera publié sur le site Web et dans le programme de la Réunion. Toute personne qui souhaiterait organiser une session est priée de faire parvenir une proposition au directeur de la Réunion avant la date limite indiquée ci-dessous.

Deadline: December 21, 2007  
Date limite : 21 décembre, 2007

## Meeting Director / Directeur de la Réunion :

Matthias Neufang  
School of Mathematics and Statistics  
4364 Herzberg Laboratories  
Carleton University  
Ottawa, Ontario, K1S 5B6 Canada  
Email: mneufang@math.carleton.ca

The following invited (partially funded) sessions have been confirmed for this conference:

Les sessions suivantes (partiellement subventionnées) ont été confirmées :

### Applied Partial Differential Equations Equations différentielles partielles appliquées

Org: D. Amundsen, L. Campbell (Carleton), F. Poulin (Waterloo)

### Dynamics of Large Groups and Semigroups Dynamique des groupes infini-dimensionnels et des semigroupes

Org: Alica Miller (Louisville), Vladimir Pestov (Ottawa)

### Geometric Group Theory Théorie Géométrique des Groupes

Org: Inna Bumagin (Carleton), Benjamin Steinberg (Carleton)

### Infinite-Dimensional Lie Theory Théorie infini-dimensionnelle de Lie

Org: Yuly Billig (Carleton), Alistair Savage (Ottawa)

### Operator Algebras Algèbres d'opérateurs

Org: Benoit Collins (Ottawa), Thierry Giordano (Ottawa)

### Probability Probabilité

Org: Antal Jarai (Carleton), Yiqiang Zhao (Carleton)

## CALL FOR NOMINATIONS 2008 David Borwein Distinguished Career Award

The David Borwein Distinguished Career Award recognizes mathematicians who have made exceptional, broad, and continued contributions to Canadian mathematics.

A complete nomination dossier consists of:

- A signed nomination statement from a present or past colleague, or collaborator (no more than three pages) having direct knowledge of the nominee's contribution;
- a short curriculum vitae, no more than five pages;
- Two to four letters of support in addition to the nomination;
- Other supporting material may be submitted, no more than 10 pages.

A nomination can be updated and will remain active for three years. Six copies of the complete nomination dossier must arrive at the CMS Executive Office no later than **November 15, 2007**.

## APPEL DE MISES EN CANDIDATURE Prix David-Borwein de mathématicien émérite pour l'ensemble d'une carrière 2008

Le prix David-Borwein de mathématicien émérite pour l'ensemble d'une carrière rend hommage à un mathématicien qui a fait une contribution exceptionnelle et soutenue aux mathématiques canadiennes.

Le dossier de candidature comprendra les éléments suivants :

- une lettre de mise en candidature signée par un collègue ou un collaborateur actuel ou des années passées (trois pages maximum) qui connaît très bien les réalisations de la personne proposée;
- un bref curriculum vitae, maximum de cinq pages;
- de deux à quatre lettres d'appui, en plus de la mise en candidature;
- tout autre document pertinent, maximum de 10 pages.

Toute mise en candidature est modifiable et demeurera active pendant trois ans. Le dossier complet, en six exemplaires, doit parvenir au bureau administratif de SMC au plus tard le **15 novembre 2007**.

### Selection Committee / Comité de sélection

David Borwein Distinguished Career Award / Prix David Borwein pour carrière distinguée  
Canadian Mathematical Society / Société mathématique du Canada  
577 King Edward, Ottawa, Ontario K1N 6N5

With its strategic location at the heart of Canada's capital, its broad variety of teaching and research initiatives offered in the two official languages, the cosmopolitan environment, and its national perspective, the University of Ottawa is truly Canada's University.

The Department of Mathematics and Statistics of the University of Ottawa invites applications to fill at least one tenure-track position in statistics or biostatistics at the Assistant or Associate professor level starting July 1, 2008. We are seeking a candidate that has a proven track-record in research and teaching at both the undergraduate and graduate level, and will be willing and able to supervise graduate students upon arrival.

Conditions of employment are set by a collective agreement.

Information about the department can be found at

<http://www.science.uottawa.ca/mathstat>

Applicants should send a curriculum vitae, a research plan, and arrange for four confidential letters of recommendation, with one addressing teaching, to be sent to **Victor LeBlanc**, Chairman, Department of Mathematics and Statistics, University of Ottawa, Ottawa, ON Canada, K1N 6N5.

Applicants are also encouraged to include copies of up to three of their most significant publications. The closing date for receipt of applications is **November 15, 2007** or until the position is filled.

All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority. Equity is a University of Ottawa policy; women, aboriginal peoples, members of visible minorities and persons with disabilities are encouraged to apply.

The University of Ottawa is justly proud of its 150-year tradition of bilingualism. Through its Second Language Institute, the University provides training to staff members and to their spouses in their second official language. At the time of tenure, professors are expected to have the ability to function in a bilingual setting. In certain cases, professors must have the ability to teach in both official languages to be granted tenure.

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Son emplacement stratégique au coeur de la capitale du pays, la grande variété de ses programmes d'enseignement et de recherche, offerts dans les deux langues officielles du Canada, sa diversité croissante ainsi que sa perspective nationale font de l'Université d'Ottawa l'Université canadienne » par excellence.

Le Département de mathématiques et de statistique de l'Université d'Ottawa met au concours au moins un poste menant à la permanence au rang de professeur adjoint ou de professeur agrégé en statistique ou en biostatistique. Entrée en fonction: le 1er juillet 2008. La personne choisie aura fait ses preuves tant comme chercheur que comme enseignant, et ce à tous les niveaux. En particulier elle pourra diriger des étudiants de deuxième et troisième cycle dès l'entrée en fonction.

Les conditions d'emploi sont déterminées par une convention collective.

Pour plus de renseignements voir

<http://www.science.uottawa.ca/mathstat>

Les candidat(e)s doivent faire parvenir leur dossier de candidature au directeur du département, **Victor LeBlanc**, Département de mathématiques et de statistique, Université d'Ottawa, Ottawa ON Canada, K1N 6N5 pour le **15 novembre 2007** et continueront d'être considérés jusqu'à ce que le poste soit comblé. Les dossiers doivent comprendre un curriculum vitae, un plan de recherche et quatre lettres de recommandation confidentielles dont une sur l'enseignement. Nous encourageons les candidat(e)s à joindre à leur dossier jusqu'à trois tirés-à-part de leurs contributions les plus importantes.

On encourage tous les candidats qualifiés à postuler ; la priorité sera toutefois accordée aux Canadiens ainsi qu'aux résidents permanents. L'Université d'Ottawa souscrit à l'équité d'emploi et elle encourage les femmes, les autochtones, les membres des minorités visibles et les personnes handicapées à postuler.

L'Université d'Ottawa est fière, avec raison, de sa tradition de bilinguisme vieille de plus de 150 ans. Par l'entremise de l'Institut des langues secondes, l'Université offre à son personnel et à leurs époux et épouses les moyens de devenir bilingue. Au moment de leur permanence, les professeurs sont tenus de pouvoir fonctionner dans un milieu bilingue. De plus, pour obtenir la permanence, certains professeurs devront pouvoir enseigner dans les deux langues officielles.



**Hilton Hotel, London (Ontario)**  
**December 8-10 décembre**  
**Host / Hôte : University of Western Ontario**

On behalf of the University of Western Ontario, the Department of Mathematics invites the mathematical community to the CMS Winter 2007 Meeting. The program will include plenary and prize lectures, and a wide variety of sessions, including a contributed paper session.

Au nom de l'Université Western Ontario, le Département de mathématiques invite la communauté mathématique à la Réunion d'hiver 2007 de la Société mathématique du Canada (SMC). Au programme : des conférenciers pléniers et des conférences de lauréats, ainsi qu'une grande diversité de sessions, y compris une session de communications libres.

## Prizes and Awards / Prix

Prix Coxeter-James Prize

Vinayak Vastal (University of British Columbia)

Prix de doctorat / Doctoral Prize

Lap Chi Lau (Chinese University of Hong Kong)

Prix Adrien Pouliot Prize

Richard Nowakowski (Dalhousie University)

Prix G. de B. Robinson Award

to be announced / à venir

## Plenary Speakers / Conférenciers pléniers

Erich Kaltofen (North Carolina State)

Mikhail Kapranov (Yale)

Blaine Lawson (SUNY/Stony Brook)

Giovanni Landi (Trieste)

Seth Lloyd (MIT)

Otmar Venjakob (Heidelberg)

Marcelo C. Borba (UNESP - São Paulo at Rio Claro)

All activities and scientific talks will be held at the Hilton Hotel and the Delta Armories Hotel.

For the most up-to-date information concerning the program, detailed schedules, registration forms and abstract submission forms, please visit the meeting website at [www.cms.math.ca/Events/](http://www.cms.math.ca/Events/).

Toutes les activités, y compris celles du programme scientifique, se dérouleront à l'hôtel Hilton et au Delta Armories.

Vous trouverez l'information la plus récente sur les programmes, y compris les horaires détaillés, les formulaires d'inscription et les formulaires électroniques pour l'envoi des résumés au [www.smc.math.ca/Events/f](http://www.smc.math.ca/Events/f).

## Sponsors

Support from the following is gratefully acknowledged. Additional information regarding support for this meeting will be posted to the meeting web site as it becomes available.

Nous remercions les organismes ci-dessous de leur soutien

financier. Nous publierons de plus amples renseignements sur le financement du congrès dès qu'ils nous parviendront.

le Centre de Recherches Mathématiques  
The Fields Institute  
MITACS  
Pacific Institute for the Mathematical Sciences  
University of Western Ontario  
- Department of Mathematics  
- Faculty of Education  
- Faculty of Science  
- Research Western  
- Department of Applied Mathematics  
Lethbridge University

Meeting Director / Directeur de la réunion :  
Dr. J.F. Jardine (Western)

Chair, Local Arrangements / Logistique locale :  
Dr. David Riley (Western)

## University of Lethbridge and the Canadian Mathematical Society establish the Jiping (Jim) Liu Memorial Travel Fund

To honour Dr. Liu's contributions to the University of Lethbridge and to continue his legacy of learning and love of education, the University and the CMS have established the **Jiping (Jim) Liu Memorial Travel Fund** to support the travel costs of graduate students to attend CMS annual winter meetings.

For 2007, the Fund will help to support graduate students attending the CMS Annual Winter Meeting which will be held in London, Ontario from December 8-10, 2007.

To apply for funds, please visit  
[www.cms.math.ca/Events/winter07b/student\\_subsidy](http://www.cms.math.ca/Events/winter07b/student_subsidy)

## L'Université de Lethbridge et la Société mathématique du Canada créent le Fonds de voyage commémoratif Jiping (Jim) Liu

En hommage à la contribution du professeur Liu à l'Université de Lethbridge, à l'importance qu'il accordait à l'apprentissage et à son amour de l'éducation, l'Université et la SMC s'unissent pour créer le **Fonds de voyage commémoratif Jiping (Jim) Liu**, destiné à favoriser la participation des étudiants des cycles supérieurs aux Réunions d'hiver annuelles de la SMC au moyen de subventions de voyage.

En 2007, le fonds aidera des étudiants des cycles supérieurs à se rendre à la Réunion d'hiver annuelle de la SMC qui se tiendra à London, en Ontario, du 8 au 10 décembre 2007.

Pour faire une demande de subvention, consultez le  
[www.cms.math.ca/Reunions/hiver07/student\\_subsidy](http://www.cms.math.ca/Reunions/hiver07/student_subsidy)

## SESSIONS

### Algebraic Combinatorics, Representations and Geometry Combinatoire algébrique, représentations et géométrie

Org: Lex Renner (Western), Benjamin Steinberg (Carleton)

Mahir Can (Western), Vlastimil Dlab (Carleton), Claus Mokler (Wuppertal), Eddy Godelle (Caen), Christophe Hohlweg (UQAM), Zhenheng Li (South Carolina), Franco Saliola (UQAM), Hugh Thomas (UNB), Steven Wang (Carleton)

### Algebraic Stacks

#### Champs algébriques

Org: Ajneet Dhillon (Western)

Arend Bayer (Utah), Renzo Cavalieri (Michigan), Mike Fried (California – Irvine), Yufeng Jiang (UBC), Kuimars Kaver (Toronto), Manish Kumar (Purdue), Daniel Krashen (Yale), Behrang Noohi (Florida State), Pramath Sastry (East Carolina), Greg Smith (Queen's), Razvan Veliche (Utah)

### Algorithmic Challenges in Polynomial and Linear Algebra

#### Défis algorithmiques dans l'algèbre polynomiale et l'algèbre linéaire

Org: Stephen Watt (Western)

### Calculus of Variations in Physics, Geometry and Economics

#### Calcul des variations, géométrie et économie

Org: Robert McCann (Toronto), Benjamin Stephens (Toronto)

### Combinatorics and its Applications to Mathematical Physics

#### Combinatoires et ses applications en physique mathématique

Org: Michael Gekhtman (Notre Dame), Michael Shapiro (Michigan State)

Renzo Cavalieri (Michigan), Leonid Chekhov, *tentative* (Steklov Mathematical Institute, Moscow), Shaun Fallat (Regina), Sergei Fomin (Michigan), Ian Goulden (Waterloo), David Jackson (Waterloo), Bruce Sagan (Michigan State), John Stembridge (Michigan), Pavel Tumarkin, *tentative* (Moscow Independent University), Ravi Vakil (Stanford)

### Complex Analytic Geometry

#### Géométrie analytique complexe

Org: Tatyana Foth (Western), Finnur Larusson (Adelaide), Rasul Shafikov (Western)

### Error Control Codes, Information Theory and Applied Cryptography

#### Codes de contrôle d'erreurs, théorie de l'information et cryptographie appliquée

Org: Aiden Bruen (Calgary), David Wehlau (Queen's and RMC)

### Graph Theory

#### Théorie des graphes

Org: Sebastian Cioaba (UC-San Diego), Stephen Kirkland (Regina), Claude Tardif (RMC)

### History and Philosophy of Mathematics

#### Histoire et philosophie des mathématiques

Org: Tom Archibald (SFU), Deborah Kent (Hillsdale College)

Tom Archibald (SFU), John Bell (Western), James Brown (Toronto), David Bellhouse (Western), Robert Dawson (St. Mary's), Alexander Jones (Toronto), Deborah Kent (Hillsdale College, Michigan), Glen van Brummelen (Quest University)

### Homotopy Theory

#### Théorie de l'homotopie

Org: Kristine Bauer (Calgary)

Kristine Bauer (Calgary), Julia Bergner (Kansas), Sunil Chebolu (Western), Dan Christensen (Western), Veronique Godin (Harvard), Izak Grguric (UBC), Dan Isaksen (Wayne State), Rick Jardine (Western), Brenda Johnson (Union College), Keith Johnson (Dalhousie), Jack Morava (Johns Hopkins), Paul Pearson (Rochester), Kate Ponto (Chicago), Dorette Pronk (Dalhousie), Laura Scull (UBC), Don Stanley (Regina), Enrique Torres (UBC), Peter Zvengrowski (Calgary)

### Iwasawa Theory

#### Théorie d'Iwasawa

Org: Manfred Kolster, Romyar Sharifi (McMaster)

Kazim Buyukboduk (Stanford), Ben Howard (Boston College), Hershy Kisilevski (Concordia), Kumar Murty (Toronto), Al Weiss (Alberta), Bei Zhang (Columbia)

### Mathematical Applications of Category Theory

#### Applications mathématiques de la théorie des catégories

Org: F. William Lawvere (SUNY-Buffalo), Walter Tholen (York)

Bernard Badzioch (Buffalo), Michael Barr (McGill), John Bell (Western), Marta Bunge (McGill), Jonathon Funk (West Indies), Gabor Lukacs (Manitoba), Ernie Manes (Massachusetts), Philip Mulry (Colgate University), Susan Niefeld (Union College), Robert Pare (Dalhousie), Dorette Pronk (Dalhousie), Bob Rosebrugh (Mount Allison), Myles Tierney (UQAM), Richard Wood (Dalhousie)

### Mathematical Imagination

#### Imagination mathématique

Org: George Gadanidis (Western)

Presenters: Robert Bilinski (Collège Montmorency), Michelle Cordy (Thames Valley District School Board), Stewart Craven (Toronto District School Board), William Higginson (Queen's), John Kezys (Mohawk College), Donna Kotsopoulos (Wilfrid Laurier)

Panelists: William Higginson (Queen's), Donna Kotsopoulos (Wilfrid Laurier), Peter Taylor (Queen's), Immaculate Namukasa (Western)

Performances: *Calculus: The Musical!* by Sadie Bowman & Mark Guzman, Matheatre; *Math-e-Motion* by Stewart Craven (Toronto District School Board); *Math Imagination Musical Performance* by George Gadanidis (Western), Daryn Bee (Western), Jenna Bee and friends.

## Mathematics of Finance

### Finance mathématique

Org: Matt Davison (Western), Rogemar Mamon (Western), Mark Reesor (Western)

Alex Badescu (Calgary), Dave Bolder (Bank of Canada), Abel Cadenillas (Alberta), Joe Campolieti (Wilfrid Laurier), Matt Davison (Western), Keldon Drudge (Prism Valuation; Waterloo), Matheus Grasselli (McMaster), Jeremy Graveline (Minnesota), Tom Hurd (McMaster), Cody Hyndman (Concordia), Sebastian Jaimungal (Toronto), Madhu Kalimipalli (Wilfrid Laurier), Valery Kholodnyi (Platts Ltd.), Rogemar Mamon (Western), Mark Reesor (Western), Dave Saunders (Waterloo), Luis Seco (Toronto), Anatoliy Swishchuk (Calgary), Matt Thompson (Queen's), Xikui Wang (Manitoba), Ken Vetzal (Waterloo), Tony Ware (Calgary)

## Non-Commutative Geometry

### Géométrie non commutative

Org: Masoud Khalkhali (Western)

## Nonlinear Wave Equations and Applications

### Équations d'ondes non linéaires et leurs applications

Org: Walter Craig (McMaster), Catherine Sulem (Toronto)

## Quantum Information Theory in Quantum Gravity

### Théorie de l'information quantique en gravité quantique

Org: David Kribs (Guelph), Fotini Markopoulou (Perimeter Institute)

## Contributed Papers

### Communications libres

Org: Tatyana Foth (Western)

## SCHEDULE / HORAIRE

(as of September 10, 2007)

THURSDAY/JEUDI December 6 décembre	SATURDAY/SAMEDI December 8 décembre	SUNDAY/DIMANCHE December 9 décembre	MONDAY/LUNDI December 10 décembre
18:00 – 22:00 Executive Committee Meeting Réunion du Comité exécutif	8:00 – 17:00 <b>Registration/Inscription</b>	8:00 – 17:00 <b>Registration/Inscription</b>	8:00 – 16:00 <b>Registration/Inscription</b>
	9:30 – 16:00 <b>Exhibits/Expositions</b>	9:30 – 16:00 <b>Exhibits/Expositions</b>	
	8:30 – 9:00 <b>Opening/Ouverture</b>	8:30 – 10:00	8:30 – 10:00
	9:00 – 9:45 <b>Marcelo C. Borba</b>	<b>Scientific Sessions</b>	<b>Scientific Sessions</b>
	10:00 – 10:30 Break/Pause		
11:00 AM – 1:00 PM Development Group Luncheon Lunch du groupe de développement	10:30 – 12:30 <b>Scientific Sessions</b>	10:30 – 11:30 <b>Scientific Sessions</b>	10:30 – 11:30 <b>Scientific Sessions</b>
		11:30 – 12:15 <b>Blaine Lawson</b>	11:30 – 12:15 <b>Otmar Venjakob</b>
	12:30 – 14:00 Lunch Break		
	14:00 – 14:45 <b>Giovanni Landi</b>	14:00 – 14:45 <b>Lap Chi Lau</b>	14:00 – 14:45 <b>Vinayak Vatsal</b>
	15:00 – 15:45 <b>Seth Lloyd</b>	15:00 – 15:45 <b>Mikhail Kapranov</b>	15:00 – 15:45 <b>Erich Kaltofen</b>
	15:45 – 16:00 Break/Pause		
	16:00 – 17:30 <b>Scientific Sessions</b>	16:00 – 17:30 <b>Scientific Sessions</b>	16:00 – 17:30 <b>Scientific Sessions</b>
7:00 – 9:00 <b>Welcome Reception</b> <b>Réception d'accueil</b>		17:30 – 18:30 <b>Richard Nowakowski</b>	
		18:00 – 19:00 <b>Reception (cash bar)</b> <b>Réception (bar payant)</b>	
		19:00 – 22:00 <b>Banquet</b>	

For the latest schedule details please visit the web site: [www.cms.math.ca/events](http://www.cms.math.ca/events)

La version la plus récente du programme est en ligne au [www.cms.math.ca/reunions](http://www.cms.math.ca/reunions)

# **UQAM, Montréal (Québec)** **June 1-6 juin**

## **Prix / Prizes and Awards**

Prix Cecil Graham pour thèse de doctorat de la SCMAI /  
 CAIMS Cecil Graham Doctoral Dissertation Award  
 Prix de recherche de la SCMAI / CAIMS Research Prize  
 Prix d'excellence en enseignement de la SMC / CMS  
 Excellence in Teaching Award  
 Prix Krieger-Nelson de la SMC / CMS Krieger-Nelson Prize -  
 Izabella Laba (UBC)  
 Conférence Jeffery-Williams de la SMC / CMS Jeffery-Williams  
 Prize - Martin Barlow (UBC)  
 Prix étudiants du Réseau MITACS / MITACS Student Awards  
 Prix du concours de présentations par affiches de MITACS /  
 MITACS Poster Competition Prizes

## **Conférenciers pléniers / Plenary Speakers**

Yves André (CNRS-ENS, Paris)  
 Olivier Biquard (Strasbourg)  
 Luc Devroye (McGill)  
 Andrew Granville (Montréal)  
 Alice Guionnet (CNRS-ENS, Lyon)  
 Rick Kenyon (UBC)  
 Gérard Laumon (CNRS-Orsay)  
 Mary Pugh (Toronto)  
 Eric Sere (Paris-Dauphine)  
 Nicole Tomczak-Jaegermann (Alberta)  
 Nizar Touzi (CREST-Paris)  
 Jianhong Wu (York)

## **Conférence populaire / Public Lecture**

Yvan Saint-Aubin (Montréal)

## **Sessions**

### **Combinatoire algébrique / Algebraic Combinatorics**

Org: Christophe Hohlweg (Fields Institute) and Franco Saliola (UQAM)

### **Groupes algébriques et sujets reliés / Algebraic Groups and Related Topics**

Org: Phillippe Gille (Paris-Sud), Zinovy Reichstein (UBC)

### **Topologie algébrique / Algebraic Topology**

Org: Alejandro Adem (UBC), Bob Oliver (Paris XIII)

### **Théorie analytique des nombres / Analytic Number Theory**

Org: Philippe Michel (Montpellier), Ram Murty (Queen's)

### **Géométrie arithmétique et théorie des nombres Arithmetic Geometry and Number Theory**

Org: Gaëtan Chenevier (CNRS-ENS, Paris), Henri Darmon (McGill)

### **Formes automorphes / Automorphic Forms**

Org: Stephen Kudla (Toronto), Colette Moeglin (CNRS-IMJ)

### **Lois d'échelle critiques pour polymères et percolation Critical Scaling for Polymers and Percolation**

Org: Edwin Perkins (UBC), Wendelin Werner (Paris Orsay)

### **Analyse complexe et théorie des opérateurs / Complex Analysis and Operator Theory**

Org: Emmanuel Fricain (Lyon), Javad Mashreghi (Laval) and Thomas Ransford (Laval)

### **Systèmes dynamiques complexes / Complex Dynamical Systems**

Org: Xavier Buff (Toulouse), Misha Lyubich (Toronto), Tan Lei (Cergy-Pontoise)

### **Mathématiques financières / Financial Mathematics**

Org: Nizar Touzi (CREST-Paris), Thomas Salisbury (York)

### **Analyse géométrique et nonlinéaire / Geometric and Nonlinear Analysis**

Org: Pengfei Guan (McGill), Emmanuel Hebey (Cergy)

### **Mécanique des fluides industrielle / Industrial Fluid Mechanics**

Org: Neil Balmforth (UBC), Jean Frédéric Gerbeau (INRIA), Bertrand Maury (Paris Orsay)

### **Méthodes cinétiques en EDP / Kinetic Methods in Partial Differential Equations**

Org: François Castella (Rennes), Reinhard Illner (Victoria)

### **Éducation Mathématique / Mathematics Education**

Org: Michèle Artigue (Paris), Bernard Hodgson (Laval)

### **Théorie des modèles et applications à la géométrie Model Theory and Applications to Geometry**

Org: Zoé Chatzidakis (CNRS), Patrick Speissegger (McMaster)

### **Géométrie non commutative et K-théorie pour algèbres d'opérateurs / Non-Commutative Geometry and K-Theory for Operator Algebras**

Org: Alain Connes (Collège de France-IHES), George Elliott (Toronto)

### **Dynamique nonlinéaire dans les sciences de la vie Nonlinear Dynamics in Life Sciences**

Org: Jacques Bélair (Montréal), Pascal Chossat (CIRM-Marseille), Fahima Nekka (Montréal), Jianhong Wu (York)

### **Analyse numérique des systèmes hyperboliques Numerical Analysis for Hyperbolic Systems**

Org: Marc Laforest (École Polytechnique de Montréal) and Emmanuel Lorin (Paris-Sud XI)

### **Équations aux dérivées partielles / Partial Differential Equations**

Org: Henri Berestycki (Paris), Robert Jerrard (Toronto)

### **Théorie des probabilités / Probability Theory**

Org: Martin Barlow (UBC), J.F. Le Gall (Paris XI-ENS)

### **Calcul scientifique / Scientific Computing**

Org: Christine Bernardi (CNRS-Paris VI), Anne Bourlioux (Montréal), Bryan Wetton (UBC)

### **Théorie des ensembles et ses applications / Set Theory and its Applications**

Org: Alain Louveau (Paris VI) and Stevo Todorcevic (Toronto; Paris Dauphine)

### **Statistique / Statistics**

Org: Yannick Baraud (Nice), Boris Levit (Queen's)



### Processus stochastiques en évolution, écologie et génétique / Stochastic Processes in Evolution, Ecology and Genetics

Org: Donald Dawson (Carleton), Sylvie Méléard (Ecole Polytechnique-Paris X)

### Topologie symplectique et de contact / Symplectic and Contact Topology

Org: Emmanuel Giroux (CNRS-ENS Lyon), Yael Karshon (Toronto)

### Topologie, noeuds et sujets reliés / Topology, Knots and Related Fields

Org: Michel Boileau (Toulouse), Stephen Boyer (UQAM)

### Méthodes variationnelles et numériques en géométrie, physique et chimie / Variational and Numerical Methods in Geometry, Physics and Chemistry

Org: Lia Bronsard (McMaster), Eric Cances (ENPC), Maria Esteban (CNRS - Paris-Dauphine)

### Femmes en mathématiques / Women in Mathematics

Org: Barbara Keyfitz (Fields), Marie-Françoise Roy (Rennes)

### Directeurs scientifiques du Congrès / Scientific Directors:

Octav Cornea (Montréal), Nassif Ghoussoub (UBC), François Loeser (École normale supérieure)

### Comité scientifique / Scientific Committee:

Jean-Pierre Bourguignon (Institut des Hautes Études Scientifiques)

Étienne Ghys (ENS, Lyon)

Arvind Gupta (SFU and MITACS)

Barbara Keyfitz (Fields and Houston)

François Lalonde (CRM and Montréal)

William F. Langford (Guelph)

Claude Le Bris (École nationale des Ponts et Chaussées)

Etienne Pardoux (Université de Provence)

Gilles Pisier (Paris VII)

Christiane Rousseau (Montréal)

## DU BUREAU DU PRÉSIDENT-ÉLU

par Anthony Lau  
University of Alberta, Edmonton

C'est la première fois que je m'adresse à vous à titre de président élu de la Société mathématique du Canada. J'aimerais remercier tous les membres, de même que mes collègues, de votre appui et de votre accueil chaleureux. Je m'efforcerai de servir la communauté mathématique au meilleur de ma capacité au cours des quatre prochaines années. Je me réjouis à l'idée de travailler avec le président, Tom Salisbury, ainsi qu'avec les membres du comité exécutif, notre personnel et les bénévoles de la Société.

J'aimerais profiter de cette occasion pour présenter à la communauté mathématique une nouvelle association mathématique connue sous le nom de PRIMA. Il y a deux ans, soit les 24 et 25 octobre 2005, j'ai eu le privilège d'être invité à la Station de recherche internationale de Banff (SRIB) à une rencontre des représentants d'un certain nombre d'organisations mathématiques renommées de pays côtiers du Pacifique, dont l'Australie, la Chine, la Corée, la Colombie, le Mexique, le Japon, le Chili, la Nouvelle-Zélande, Singapour, Hong Kong, les É.-U., et en particulier le PIMS, le MSRI et la SRIB. À cette occasion, les participants ont adopté une résolution prévoyant la création d'un organisme qui s'appellerait « Pacific Rim Mathematical Association » (PRIMA - l'Association mathématique Pacific Rim) et qui aurait pour mission de promouvoir les sciences mathématiques dans les pays côtiers du Pacifique. La PRIMA est une association mathématique générale dont la coordination est assurée par Alejandro Adem, titulaire d'une Chaire de recherche du Canada en topologie à l'Université de la Colombie-Britannique et directeur adjoint du PIMS. Ses membres appartiennent à l'une des trois catégories suivantes : instituts, départements de sciences mathématiques et sociétés mathématiques nationales. Son financement initial provient du MSRI et du PIMS. Cette association créera de belles occasions pour les mathématiciens canadiens de côtoyer des collègues de pays de la région du Pacifique.

Au nombre des activités de la PRIMA, mentionnons le congrès Pacific Rim, des programmes d'été pour étudiants diplômés, des échanges d'universitaires, des services d'orientation mixtes, des doctorats interuniversitaires, des groupes élargis de recherche en collaboration, des conférences parrainées par la PRIMA, le partage des connaissances entre les instituts et la promotion des mathématiques dans les pays en développement.

Le site internet de la PRIMA ([www.primath.org](http://www.primath.org)) donne la longue liste des activités prévues en 2007. En ce moment, l'association concentre ses énergies à l'organisation du premier congrès de la PRIMA qui se tiendra du 13 au 17 juillet 2009 à la University of New South Wales, à Sydney, en Australie. On y attend quelque 500 participants, qui auront droit à des conférenciers principaux, à des sessions spéciales et à la remise de prix à de jeunes mathématiciens exceptionnels. Le comité scientifique se compose de Rafael Benguria (Catholic University, Chili), Phil Broadbridge (Australian Mathematical Sciences Institute, Australie), Kung-Ching Chang (Peking University, Chine), Michael Cowling (University of New South Wales, Australie), Jose Antonio de la Peña (UNAM et Conseil national des sciences et de la technologie du Mexique, Mexique), David Eisenbud [PRÉSIDENT] (UC Berkeley, É.-U.), Ivar Ekeland (Université de la Colombie-Britannique, Canada), Yasha Eliashberg (Stanford University, É.-U.), Masaki Kashiwara (RIMS, Kyoto University, Japon), Hyo Chul Myung (Korea Institute of Advanced Study, Korea) et Tatiana Toro (University of Washington, É.-U.).

En 2007, la Réunion d'hiver de la Société mathématique du Canada se tiendra à l'Université Western Ontario à London, en Ontario, du 8 au 10 décembre. Le deuxième congrès Canada-France se tiendra pour sa part au Centre de recherches mathématiques à Montréal, du 2 au 6 juin 2008. J'espère vivement vous y voir en grand nombre.

## CALL FOR NOMINATIONS - 2008 DOCTORAL PRIZE APPEL DE MISES EN CANDIDATURE - PRIX DE DOCTORAT 2008

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

Les mises en candidature qui ne seront pas choisies dans leur première compétition seront considérées pour une année additionnelle (sans possibilité de mise à jour du dossier), et seront révisées par le comité de sélection du Prix de doctorat l'an prochain.

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

### Candidatures

Les candidats doivent être nommés par leur université; la personne qui propose un candidat doit se charger de regrouper les documents décrits aux paragraphes suivants et de faire parvenir la candidature à l'adresse ci-dessous. Aucune université ne peut nommer plus d'un candidat. Les candidatures doivent parvenir à la SMC au plus tard le **31 janvier 2008**.

Le dossier sera constitué des documents suivants :

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

### Président du Comité de sélection du Prix de doctorat Chair, Doctoral Prize Selection Committee

Société mathématique du Canada / Canadian Mathematical Society  
577 King Edward  
Ottawa, Ontario Canada K1N 6N5

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

Nominations that were not successful in the first competition, will be kept active for a further year (with no possibility of updating the file) and will be considered by the Doctoral Prize Selection Committee in the following year's competition.

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

### Nominations

Candidates must be nominated by their university and the nominator is responsible for preparing the documentation described below, and submitting the nomination to the address below. No university may nominate more than one candidate and the deadline for the receipt of nominations is **January 31, 2008**.

The documentation shall consist of:

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

## BOOK REVIEW *continued*

### References

- [E] G. Elfving, *The history of mathematics in Finland, 1828 – 1918*, Societas Scientiarum Fennica, Helsinki, (1981).
- [FNRR] C.K. Fong, E. Nordgren, H. Radjavi, P. Rosenthal, *Weak resolvents of linear operators. II*, Indiana Univ. Math. J. 39 (1990), 67–83.
- [L] O. Lehto, *Korkeat mailmat: Rolf Nevanlinnan elämä*, Otava, Helsinki, (2001).
- [Ne] E. Neovius, *La plus haute mission de notre époque*, Varsovie, (1879).
- [Nev] O. Nevanlinna, *Convergence of iterations for linear equations*, Lectures in Mathematics ETH Zürich, Birkhäuser Verlag, Basel, (1993).

- [NRR] E. Nordgren, H. Radjavi, P. Rosenthal, *Weak resolvents of linear operators*, Indiana Univ. Math. J. 36 (1987), 913–934.
- [S] J. H. Shapiro, *Composition operators and classical function theory*, Universitext: Tracts in Mathematics, Springer-Verlag, New York, (1993).
- [W] M. C. White, *Analytic multivalued functions and symmetrically normed ideals*, Ph.D. Thesis, University of Cambridge, (1989).

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## NÉCROLOGIE / OBITUARY: Radu Theodorescu

Chers collègues et amis,

J'ai le pénible devoir de vous informer du décès de notre collègue Radu Theodorescu, survenu à Québec le 14 août 2007, à l'âge de 74 ans. Professeur émérite de mathématiques et de statistique à l'Université Laval, Radu était un membre de longue date de la Société Mathématique du Canada et membre honoraire de la Société statistique du Canada depuis 2000.

Radu naquit à Bucharest (Roumanie) le 12 avril 1933. Fils du célèbre médecin Dan Theodorescu et de son épouse Ortensia Butoianu, Radu étudia les mathématiques à l'Université de Bucharest (B.Sc., 1954 ; Ph.D., 1958 ; D.Sc., 1967). Il y fit la connaissance d'Anca Florescu, qu'il épousa. Leur fils Dan Jr, né en 1962, est chirurgien et professeur d'urologie à l'Université de Virginie. Radu divorça en 1982 et quelques années plus tard, il rencontra Marie-José Michiels, avec laquelle il refit sa vie. Deux enfants naquirent de leur union : Paul, né en 1985, étudie actuellement la médecine à l'Université de Sherbrooke ; Anne, née en 1987, est étudiante en médecine vétérinaire à l'Université de Montréal.

Après avoir été associé pendant dix ans à l'Institut de mathématiques de l'Académie roumaine des sciences, Radu devint le premier directeur de la Direction des statistiques industrielles du tout nouveau Centre de statistique mathématique de l'Académie en 1964. Il fut recruté par l'Université Laval en 1968 et y poursuivit une carrière d'enseignement et de recherche jusqu'à sa retraite, en 1999. Auteur ou coauteur de plus de 160 articles scientifiques et de 13 livres ou monographies, il supervisa de nombreux étudiants de deuxième et de troisième cycle à Québec et ailleurs. Co-opté membre de l'Institut international de statistique en 1969, il devint compagnon de l'Institut de statistique mathématique en 1986 et de la Société américaine pour la qualité en 1989. Il était membre honoraire de la Société statistique du Canada et de la Société roumaine de statistique depuis 2000.

Pour de plus amples détails concernant Radu et sa phénoménale carrière de chercheur en probabilités et en statistique, on peut consulter les sources suivantes en ligne :

Un nouveau membre honoraire pour la SSC (2000) : *Liaison*, vol. 14, no 3, pp. 11-12 :

[www.theodorescu.ca/Liaison1.pdf](http://www.theodorescu.ca/Liaison1.pdf)

Présentation d'un nouveau professeur émérite à Laval (2001) :

[www.theodorescu.ca/Tavenas.pdf](http://www.theodorescu.ca/Tavenas.pdf)

Un entretien avec Radu Theodorescu (2004) : *Liaison*, vol. 18, no 4, pp. 38-48 : [www.theodorescu.ca/Liaison2.pdf](http://www.theodorescu.ca/Liaison2.pdf)

Le curriculum vitae académique de Radu :

[www.theodorescu.ca/CV.pdf](http://www.theodorescu.ca/CV.pdf)

La liste de publications de Radu :

[www.theodorescu.ca/Publications.pdf](http://www.theodorescu.ca/Publications.pdf)

Au nom des membres du département de mathématiques et de statistique, ainsi qu'en mon nom personnel, je prie les membres de la famille de Radu d'agréer nos bien vives condoléances et l'expression de notre douloureuse sympathie.

Le directeur du département de mathématiques et statistique de l'Université Laval,  
Roger Pierre



Dear colleagues and friends,

It is my sad duty to announce the death of our colleague Radu Theodorescu, who passed away in Québec on August 14, 2007, at the age of 74. A Professor Emeritus of Mathematics and Statistics at Université Laval, Radu was a long-standing member of the Canadian Mathematical Society and an Honorary Member of the Statistical Society of Canada since 2000.

Radu was born in Bucharest (Romania) on April 12, 1933. The son of the famous physician Dan Theodorescu and his wife Ortensia Butoianu, Radu studied mathematics at the University of Bucharest (B.Sc., 1954; Ph.D., 1958; D.Sc., 1967). There he met Anca Florescu, whom he married. Their son Dan Jr, born in 1962, is a surgeon and a Professor of Urology at the University of Virginia. Radu divorced in 1982 and a few years later, he

met Marie-José Michiels with whom he started a new life. They had two children: Paul, born in 1985, is currently a medical student at the Université de Sherbrooke; Anne, born in 1987, is studying veterinary medicine at the Université de Montréal.

Radu was associated for ten years with the Mathematical Institute of the Romanian Academy of Sciences, before becoming the first Director of the Industrial Statistics Section of the brand-new Mathematical Statistics Centre of the Academy in 1964. In 1968, he joined Université Laval, where he pursued a career in teaching and research until his retirement in 1999. The author or the co-author of more than 160 scientific papers and 13 monographs or textbooks, he supervised several M.Sc. and Ph.D. students in Québec and elsewhere. Co-opted as a member of the International Statistical Institute in 1969, he became a fellow of the Institute of Mathematical Statistics in 1986 and a fellow of the American Society for Quality in 1989. He was an Honorary Member of the Statistical Society of Canada and an Honorary Member of the Statistical Society of Romania since 2000.

For further details about Radu and his phenomenal career as a researcher in probability and statistics, the following are available on line:

A new Honorary Member for the SSC (2000): *Liaison*, vol. 14, no 3, pp. 11-12: [www.theodorescu.ca/Liaison1.pdf](http://www.theodorescu.ca/Liaison1.pdf)

Presentation of a new Professor Emeritus at Laval (2001):

[www.theodorescu.ca/Tavenas.pdf](http://www.theodorescu.ca/Tavenas.pdf)

A conversation with Radu Theodorescu (2004): *Liaison*, vol.

18, no 4, pp. 38-48: [www.theodorescu.ca/Liaison2.pdf](http://www.theodorescu.ca/Liaison2.pdf)

Radu's academic curriculum vitae:

[www.theodorescu.ca/CV.pdf](http://www.theodorescu.ca/CV.pdf)

Radu's list of publications:

[www.theodorescu.ca/Publications.pdf](http://www.theodorescu.ca/Publications.pdf)

All the members of the département de mathématiques et de statistique join me in expressing our sorrow and deepest condolences to Radu's family for the loss of their loved one.

Roger Pierre

Chairman of département de mathématiques et de statistique, Université Laval



[www.careers.ualberta.ca](http://www.careers.ualberta.ca)

### Tenure Track Position, Mathematical Finance

The Department of Mathematical and Statistical Sciences at the University of Alberta invites applications for a tenure track position in the area of Mathematical Finance. We primarily seek candidates at the Assistant Professor level, but exceptional candidates at a more senior level will be considered.

The successful candidate will have established accomplishments and outstanding promise in research, as well as a strong commitment to graduate and undergraduate teaching. Candidates must hold a PhD degree. We offer an excellent research environment with a normal teaching load of three courses per year. A close fit with some of the existing research being presently conducted in the Department is an asset.

Alberta is one of the leading Mathematics Departments in Canada and has strong connections with other mathematical institutes, such as the Pacific Institute

for the Mathematical Sciences (PIMS), Mathematics of Information Technology and Complex Systems (MITACS), and the Banff International Research Station (BIRS). For more information about the Department, please visit our website at <http://www.math.ualberta.ca/>.

Applications should include a curriculum vitae, a research statement, a teaching profile outlining experience and/or interests, and at least three confidential letters of reference.

The closing date for applications is November 16, 2007, or until a suitable candidate is found. Early applications are encouraged.

Interested applicants may apply to:

**Arturo Pianzola, Chair**  
**Department of Mathematical and Statistical Sciences**  
**University of Alberta**  
**Edmonton, Alberta, Canada T6G 2G1**  
**Email: [chairsec@math.ualberta.ca](mailto:chairsec@math.ualberta.ca)**

All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority. If suitable Canadian citizens and permanent residents cannot be found, other individuals will be considered. The University of Alberta hires on the basis of merit. We are committed to the principle of equity in employment. We welcome diversity and encourage applications from all qualified women and men, including persons with disabilities, members of visible minorities, and Aboriginal persons.



[www.careers.ualberta.ca](http://www.careers.ualberta.ca)

### Max Wyman Assistant Professorship in Mathematical Biology

The Department of Mathematical and Statistical Sciences at the University of Alberta invites applications for a Max Wyman Assistant Professorship in Mathematical Biology. This is a three-year fixed-term position. The position offers an excellent research and teaching environment with a reduced teaching load (averaging two one-semester courses per year). A startup research grant is included with the position.

We are looking for a person with a PhD, an excellent research record in Mathematical Biology, and strong communication and teaching skills. Candidates are expected to develop an independent research program, and will be eligible to apply for federal research funds. They are expected to participate in graduate training and to be active in the Centre for Mathematical Biology ([www.math.ualberta.ca/~mathbio](http://www.math.ualberta.ca/~mathbio)). All aspects of Mathematical Biology will be considered. Current interests within the department include ecology, epidemiology, medicine and physiology.

Alberta is one of the leading Mathematics Departments in Canada and has strong connections with other mathematical

institutes, such as the Pacific Institute for the Mathematical Sciences (PIMS), Mathematics of Information Technology and Complex Systems (MITACS), and the Banff International Research Station (BIRS).

Applications should include a curriculum vitae, research and teaching profiles outlining experience and/or interests, and at least three confidential letters of reference.

The closing date for applications is November 16, 2007, or until a suitable applicant is found. Early applications are encouraged.

For more information about the Department and the University of Alberta, please visit our web page ([www.math.ualberta.ca](http://www.math.ualberta.ca)).

Interested applicants may apply to:

**Arturo Pianzola, Chair**  
**Department of Mathematical and Statistical Sciences**  
**University of Alberta**  
**Edmonton, Alberta, Canada T6G 2G1**  
**Email: [chairsec@math.ualberta.ca](mailto:chairsec@math.ualberta.ca)**

All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority. If suitable Canadian citizens and permanent residents cannot be found, other individuals will be considered. The University of Alberta hires on the basis of merit. We are committed to the principle of equity in employment. We welcome diversity and encourage applications from all qualified women and men, including persons with disabilities, members of visible minorities, and Aboriginal persons.





[www.careers.ualberta.ca](http://www.careers.ualberta.ca)

### Tenure Track Position, Statistics and Probability

The Department of Mathematical and Statistical Sciences at the University of Alberta invites applications for a tenure-track position in the area of Statistics and Probability. We primarily seek candidates at the Assistant Professor level, but exceptional candidates at a more senior level will be considered.

The successful candidate will have established accomplishments and outstanding promise in research, as well as a strong commitment to graduate and undergraduate teaching. Candidates must hold a PhD degree. We offer an excellent research environment with a normal teaching load of three courses per year. A close fit with some of the existing research being presently conducted in the Department is an asset. Our Statistics and Probability group encompasses a broad spectrum of research interests, ranging from such interdisciplinary areas as Biostatistics and Environmetrics, through core research areas such as Regression, Design, Sampling and notions of Robustness and of Statistical Learning as applied to these and other areas, and on to theoretical investigations as embodied by Mathematical Statistics, Probability, and Stochastic Processes.

Alberta is one of the leading Mathematics Departments in Canada and has strong connections with other mathematical institutes, such as the Pacific Institute for the Mathematical Sciences (PIMS), Mathematics of Information Technology and Complex Systems (MITACS), and the Banff International Research Station (BIRS). For more information about the Department, please visit our websites at <http://www.mathstat.ualberta.ca/> and <http://www.stat.ualberta.ca/>.

Applications should include a curriculum vitae, a research statement, a teaching profile outlining experience and/or interests, and at least three confidential letters of reference.

The closing date for applications is November 16, 2007, or until a suitable candidate is found. Early applications are encouraged.

Interested applicants may apply to:

**Arturo Pianzola, Chair**  
**Department of Mathematical and Statistical Sciences**  
**University of Alberta**  
**Edmonton, Alberta, Canada T6G 2G1**  
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[www.careers.ualberta.ca](http://www.careers.ualberta.ca)

### Tenure Track Position, Representation Theory

The Department of Mathematical and Statistical Sciences at the University of Alberta invites applications for a tenure-track position in the area of Representation Theory. We primarily seek candidates at the Assistant Professor level, but exceptional candidates at a more senior level will be considered.

The successful candidate will have established accomplishments and outstanding promise in research, as well as a strong commitment to graduate and undergraduate teaching. Candidates must hold a PhD degree. We offer an excellent research environment with a normal teaching load of three courses per year. A close fit with some of the existing research being presently conducted in the Department is an asset.

Alberta is one of the leading Mathematics Departments in Canada and has strong connections with other mathematical institutes, such as the Pacific Institute for the Mathematical Sciences (PIMS), Mathematics of

Information Technology and Complex Systems (MITACS), and the Banff International Research Station (BIRS). For more information about the Department, please visit our website at <http://www.math.ualberta.ca/>.

Applications should include a curriculum vitae, a research statement, a teaching profile outlining experience and/or interests, and at least three confidential letters of reference.

The closing date for applications is November 16, 2007, or until a suitable candidate is found. Early applications are encouraged.

Interested applicants may apply to:

**Arturo Pianzola, Chair**  
**Department of Mathematical and Statistical Sciences**  
**University of Alberta**  
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All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority. If suitable Canadian citizens and permanent residents cannot be found, other individuals will be considered. The University of Alberta hires on the basis of merit. We are committed to the principle of equity in employment. We welcome diversity and encourage applications from all qualified women and men, including persons with disabilities, members of visible minorities, and Aboriginal persons.

# CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

## OCTOBER 2007 OCTOBRE

**19-20** Southeast Atlantic Regional Conference on Differential Equations (Murray State University, Murray, Kentucky)  
<http://campus.murraystate.edu/searcde/>

**21-27** The ADONET-CIRM School of Graphs and Algorithms (Grand Hotel Bellavista, Levico Terme, Trento, Italy)  
[www.science.unitn.it/cirm/ADONETCIRM07.html](http://www.science.unitn.it/cirm/ADONETCIRM07.html)

**29-Nov 2** "Von Neumann Algebras" (Fields Institute workshop)  
[www.fields.utoronto.ca/programs/scientific/07-08/operator\\_algebras/](http://www.fields.utoronto.ca/programs/scientific/07-08/operator_algebras/)

## NOVEMBER 2007 NOVEMBRE

**1-5** Joint AARMS-CRM Workshop on Recent Advances in Functional and Delay Differential Equations (Dalhousie University, Halifax, NS)  
[www.crm.math.ca/Dynamics2007/](http://www.crm.math.ca/Dynamics2007/)

**12-16** "Structure of  $C^*$ -Algebras", (Fields Institute workshop)  
[www.fields.utoronto.ca/programs/scientific/07-08/operator\\_algebras/](http://www.fields.utoronto.ca/programs/scientific/07-08/operator_algebras/)

**14-16** Workshop on Dynamical System and Continuum Physics (CRM, University of Montreal, Montreal, Quebec)  
[www.crm.math.ca/Dynamics2007/](http://www.crm.math.ca/Dynamics2007/)

## DECEMBER 2007 DÉCEMBRE

**3-7** International Conference on Topology and its Applications 2007 (Jointly with 4th Japan Mexico Topology Conference) (Kyoto University, Kitashirakawa-Oiwakecho, Sakyo, Kyoto, Japan)  
[www.math.sci.ehime-u.ac.jp/jamex/](http://www.math.sci.ehime-u.ac.jp/jamex/)

**7-11** Fourth Pacific Rim Conference (City University of Hong Kong, Kowloon, Hong Kong)  
[www6.cityu.edu.hk/rcms/prcm4/](http://www6.cityu.edu.hk/rcms/prcm4/)

**8-10** CMS Winter 2007 Meeting, Host: University of Western Ontario; Hilton Hotel, London, Ontario (meetings@cms.math.ca)  
[www.cms.math.ca/Events/winter07](http://www.cms.math.ca/Events/winter07)

**11-14** Workshop on Chaos and Ergodicity of Realistic Hamiltonian Systems (CRM, University of Montreal, Montreal, Quebec)  
[www.crm.math.ca/Dynamics2007/](http://www.crm.math.ca/Dynamics2007/)

**11-15** "Operator Spaces and Quantum Groups", (Fields Institute workshop)  
[www.fields.utoronto.ca/programs/scientific/07-08/operator\\_algebras/](http://www.fields.utoronto.ca/programs/scientific/07-08/operator_algebras/)

**12-15** First Joint International Meeting between the AMS and the New Zealand Mathematical Society (NZMS) (Wellington, New Zealand)  
[www.ams.org/amsmtgs/internmtgs.html](http://www.ams.org/amsmtgs/internmtgs.html)

## JANUARY 2008 JANVIER

**6-9** Joint Mathematics Meetings (San Diego, CA)  
[www.ams.org/amsmtgs/national.html](http://www.ams.org/amsmtgs/national.html)

**7-11** Workshop on Recent Advances in Operator Theory and Function Theory, (Fields Institute, Toronto, ON)  
[www.fields.utoronto.ca/programs/scientific/07-08/harmonic\\_analysis/](http://www.fields.utoronto.ca/programs/scientific/07-08/harmonic_analysis/)

**18-19** Young Mathematicians' Conference (CRM, Montreal, QC)  
[activities@crm.umontreal.ca](mailto:activities@crm.umontreal.ca)

**24-26** Initial Conditions Workshop (CRM, Montreal, QC)  
[activities@crm.umontreal.ca](mailto:activities@crm.umontreal.ca)

## FEBRUARY 2008 FÉVRIER

**18 - 24** Joint Mathematics Meetings (San Diego, CA)  
[www.ams.org/amsmtgs/national.html](http://www.ams.org/amsmtgs/national.html)

**18 - 24** Workshop on Harmonic Analysis, (Fields Institute, Toronto, ON)  
[www.fields.utoronto.ca/programs/scientific/07-08/harmonic\\_analysis/](http://www.fields.utoronto.ca/programs/scientific/07-08/harmonic_analysis/)

## MARCH 2008 MARS

**5-7** The ICM Centennial Symposium (Accademia dei Lincei, Rome, Italy)  
[www.unige.ch/math/EnsMath/Rome2008/](http://www.unige.ch/math/EnsMath/Rome2008/)

**8** The Istituto dell'Enciclopedia Italiana (Accademia dei Lincei, Rome, Italy)  
[www.unige.ch/math/EnsMath/Rome2008/](http://www.unige.ch/math/EnsMath/Rome2008/)

## APRIL 2008 AVRIL

**5-13** Clay-Fields Conference on Additive Combinatorics, Number Theory, and Harmonic Analysis  
[www.fields.utoronto.ca/programs/scientific/07-08/harmonic\\_analysis/](http://www.fields.utoronto.ca/programs/scientific/07-08/harmonic_analysis/)

**7-11** Workshop: Spectrum and Dynamics (CRM, Montreal, QC)  
[activities@crm.umontreal.ca](mailto:activities@crm.umontreal.ca)

## MAY 2008 MAI

**12-16** Workshop: Singularities, Hamiltonian and Gradient Flows (CRM, Montreal, QC)  
[activities@crm.umontreal.ca](mailto:activities@crm.umontreal.ca)

## JUNE 2008 JUIN

**1-6** Second Canada-France Congress (UQAM, Montréal, QC)  
[www.cms.math.ca/Events](http://www.cms.math.ca/Events)

## JULY 2008 JUILLET

**6-13** Eleventh International Congress on Mathematics Education (ICME-11)(Monterrey, Mexico)  
<http://icme11.org/node/12>

**25-28** Seventh Iberoamerican Conference on Topology and its Applications-Valencia (Spain)  
<http://cita.webs.upv.es>

## EMPLOYMENT OPPORTUNITY



### Fields Institute Postdoctoral Fellowships 2008-09

Description: Applications are invited for postdoctoral fellowship positions at the Fields Institute in Toronto for the 2008-2009 academic year. The Thematic Program on Arithmetic Geometry, Hyperbolic Geometry and Related Topics will take place at the Institute July to December 2008 and the Thematic Program on O-Minimal Structures and Real Analytic Geometry will take place at the Institute from January to June 2009. The fellowships provide for a period of engagement in research and participation in the activities of the Institute. They may be offered in conjunction with partner universities, through which a further period of support may be possible.

Eligibility: Qualified candidates who will have recently completed a PhD in a related area of the mathematical sciences are encouraged to apply.

Deadline: **December 7, 2007**, although late applications may be considered.

Application Information: Please consult  
[www.fields.utoronto.ca/proposals/postdoc.html](http://www.fields.utoronto.ca/proposals/postdoc.html)

The Fields Institute is strongly committed to diversity within its community and especially welcomes applications from women, visible minority group members, Aboriginal persons, persons with disabilities, members of sexual minority groups, and others who may contribute to the further diversification of ideas.

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## Numerical Linear Algebra

G. Allaire, École Polytechnique Palaiseau, France;  
S. M. Kaber, Université Pierre et Marie Curie, Lab.  
Jacques-Louis Lions, France

This book distinguishes itself from the many other textbooks on the topic of linear algebra by including mathematical and computational chapters along with examples and exercises with Matlab. Using both Matlab and SciLab software, the book covers core standard material and contains an excellent variety of exercises. Scilab exercises are also included online. In recent years, the use of computers in many areas of engineering and science has made it essential for students to get training in numerical methods and computer programming.

2007. Approx. 400 p. (Texts in Applied Mathematics, Volume 55) Hardcover  
ISBN 978-0-387-34159-0 ► **\$59.95**

## Semiparallel Submanifolds in Space Forms

Ü. Lumiste, University of Tartu, Estonia

This book offers a comprehensive survey to date of the theory of semiparallel submanifolds. Introduced in 1985, semiparallel submanifolds have emerged as an important area of research within differential geometry and topology.

Lumiste begins with the necessary background on: symmetric and semisymmetric Riemannian manifolds, smooth manifolds in space forms, and parallel submanifolds. Semiparallel submanifolds are introduced in Chapter 4, where characterizations of their class and several subclasses are given. In later chapters Lumiste introduces the concept of main symmetric orbit and presents all known results concerning umbilic-like main symmetric orbits.

**Semiparallel Submanifolds in Space Forms** will appeal to both researchers and graduate students.

2008. Approx. 325 p. Hardcover  
ISBN 978-0-387-49911-6 ► **approx. \$79.95**

## Lie Sphere Geometry

**With Applications to Submanifolds**

T. E. Cecil, College of the Holy Cross, Worcester, MA, USA

This is a modern treatment of Lie's geometry of spheres, its applications and the study of Euclidean space. It begins with Lie's construction of the space of spheres, including fundamental notions of oriented contact, parabolic pencils of spheres and Lie sphere transformation. Revised material in this new edition includes taut submanifolds, compact proper Dupin submanifolds, reducible Dupin submanifolds, Lie frames and frame reductions. New material includes isoparametric hyperspaces in spheres, Dupin hyperspaces with three and four principle curvatures.

2nd ed. 2008. Approx. 305 p. 14 illus. (Universitext) Softcover  
ISBN 978-0-387-74655-5 ► **approx. \$49.95**

## An Introduction to Bayesian Scientific Computing

**Ten Lectures on Subjective Computing**

E. Somersalo, Helsinki University of Technology, Helsinki, Finland; D. Calvetti, Case Western Reserve University, Cleveland, OH, USA

This book has been written for undergraduate and graduate students in various areas of mathematics and its applications. It is for students who are willing to get acquainted with Bayesian approach to computational science but not necessarily to go through the full immersion into the statistical analysis. It has also been written for researchers working in areas where mathematical and statistical modeling are of central importance, such as biology and engineering.

2007. Approx. 215 p. (Surveys and Tutorials in the Applied Mathematical Sciences, Volume 2) Softcover  
ISBN 978-0-387-73393-7 ► **\$39.95**



## An Introduction to Manifolds

L. W. Tu, Tufts University, Medford, MA, USA

This book introduces the fundamental theory of manifolds in a readable but rigorous manner. In Part I the theory of differential forms on  $R^n$  is presented as a natural bridge between calculus and the theory of manifolds. Once this intuitive foundation is laid, manifolds are defined in Part II, and several examples considered. In Parts III and IV tangent spaces are introduced, along with Lie groups and Lie algebras. Throughout, the author emphasizes the connection between tangent spaces and the familiar methods of linear approximation from calculus. With this background in place, calculus on manifolds is studied, and important topological invariants, such as the de Rham cohomology, are computed. This book introduces manifolds at a level suitable for advanced undergraduates and beginning graduate students.

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