



CMS NOTES de la SMC

AWARD LECTURE: 2008 CMS EXCELLENCE IN TEACHING AWARD

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Editor's note. In place of our standard cover page article in this issue, we are publishing the text of Ed Bierstone's presentation on receiving the CMS Excellence in Teaching Award at the CMS 2008 Summer Meeting in Montreal.

I am honoured to receive the CMS Excellence in Teaching Award, and would like to express my heartfelt appreciation to the Canadian Mathematical Society and to Nelson Education Ltd. for their support of undergraduate mathematics education through this award.

I'd like to begin with a disclaimer: The easiest way to be considered a good teacher is to have great students! During the thirty-five years that I've taught at U of T, I've been truly fortunate to have had so many exceptional students. They've been passionate about mathematics, and they've cared for each other and about the world. I know that statements from my former students formed a big part of my nomination for the CMS teaching award. I am honoured and very moved to know that my students

Reflections on Teaching Undergraduate Mathematics.

feel I've contributed to their inspiration.

This is the first time I'm giving a talk on teaching. I haven't been involved in pedagogical research — I just give my classes, I try to be nurturing to my students and to communicate my passion for mathematics. I'm more comfortable talking about mathematics than talking about teaching it! The CMS Excellence in Teaching Award is unusual in that it focuses on the quality of teaching itself — on effectiveness in undergraduate classes and on our influence on students and other teachers. Like most of us, I spend a lot of time and effort on undergraduate teaching, but I don't think very much about philosophy and methods of teaching. This talk has given me the opportunity (or perhaps obliged me) to think about why we teach or how I do it. I want to share a few of my experiences and my thoughts on undergraduate teaching.

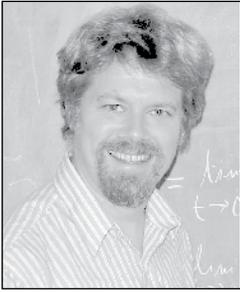
My disclaimer touches on the relationship between teaching and learning. Our best students sometimes need no teachers. When we evaluate teaching, the criteria don't always include our students' learning experiences. And when we do try to evaluate

how much students learn or whether they've been inspired by our classes, we're often in contact only with students who are like ourselves, comfortable with mathematical ideas or interested in a career related to mathematics. Our large classes have so many students of great potential whose main interests are not in the direction of mathematics. It's not so clear whether we engage them in learning, or how inspired they are by our teaching, or whether we help open career paths for them.

I'm not going to discuss issues of teaching reform, but only my personal feelings about the goals of teaching undergraduate mathematics, and how I try to do it well.

Human interaction. There are three related things that I feel contribute to my effectiveness as an undergraduate teacher.

The first is simply that I love teaching and I care about my students. I am still excited when I meet a class for the first time, and a little apprehensive. The quality of my classes depends a lot on the feeling of contact that gets established between my students and me. I'm usually in tune with my students' feelings. I'm thrilled by their successes and pained by their failures. My undergraduate courses are



To Slow the Circles Down

On the fascinating “Art of Problem Solving” website [1], aimed largely at high school math contestants, Richard Rusczyk has an article called “The Calculus Trap”. Given the context, one might expect this to be a warning about the dangers of using Lagrange multipliers, rather than more elegant elementary techniques, for Olympiad

inequality problems.

Nothing so simple. Much more subversively, Rusczyk argues against the common practice of encouraging the best math students to rush through high school mathematics and get an early start on university calculus. Instead, he advocates for math clubs and other environments that foster a more profound knowledge of elementary mathematics.

So what’s wrong with calculus? It is true that in many universities, it is primarily taught as a service course, to a captive audience many of whom want to satisfy the requirements of their major departments as painlessly as possible and without endangering their GPA. However, even the “ANSI standard Calc I” has plenty of interesting features, and a good instructor can find more. The problem is not with calculus; it is with the rush to get it over with as soon as possible.

More and more high schools have calculus courses in Grade 12. In contrast, courses in any other area of mathematics outside the “main sequence”, such as Euclidean geometry, are vanishingly rare. The reason for this is obvious: calculus is the standard introductory math course in faculties of science. Some high school calculus courses are only intended as preparation for the first year university course; others, like the AP and IB courses, are designed to replace it. To recruit the best students, universities are under pressure to offer university-equivalent credit for these and similar courses. With a few overloads or sessions of summer school, this can reduce a four year degree to three years. With today’s tuition levels, and the salaries available after graduation, the financial incentive is obvious.

But is early graduation a good thing? Undergraduate days may or may not be “the happiest years of your life”, but once the door closes on them it doesn’t reopen. The same is true for high school. In each institution, there are unique opportunities for social and personal development, as well as education. Is there really any hurry to leave early? As Joni Mitchell put it,

“...Take your time, it won’t be long now
Till you drag your feet to slow the circles down” [2]

Individual cases, of course, differ; and what is right for one student may not be right for another. However, in general we should probably encourage able students to do more while they are in school or university, not to get out as fast as possible. In the big picture, it will make very little difference if the best and brightest of the next generation of mathematicians get out into the workplace a year younger. What will perhaps change the world is if they use their talents to learn more — be it

mathematics or anything else — during the years that they have in high school and university.

This is why enrichment activities that emphasize and encourage depth and breadth of education are so important. Math circles, journals such as *Crux Mathematicorum*, math camps, popular math books, web sites, math contests, summer research positions: all of these provide opportunities for mathematically gifted young people to linger and enjoy the years of their education, and get more out of it.

What can you do to help?

[1] www.artofproblemsolving.com

[2] Joni Mitchell, “The Circle Game”, © Siquomb Publishing Co.

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Ou prendre le temps de vivre

Sur le fascinant site *Art of Problem Solving* [1], qui s'adresse principalement aux élèves du secondaire participant à des concours mathématiques, Richard Rusczyk propose un article intitulé *The Calculus Trap* (Le piège du calcul). Compte tenu de la nature du site, on pourrait s'attendre à une mise en garde contre les risques d'utiliser les multiples de Lagrange plutôt que des techniques élémentaires plus élégantes pour résoudre les problèmes d'inégalité dans les olympiades de mathématiques.

Mais ce n'est pas aussi simple. De façon beaucoup plus subversive, Rusczyk prend position contre l'habitude que nous avons d'encourager les meilleurs élèves à se dépêcher de réussir leurs maths de secondaire afin de s'attaquer aussitôt que possible aux mathématiques de niveau universitaire. Il prône plutôt les clubs de mathématiques et autres formules qui favorisent une connaissance approfondie des mathématiques élémentaires.

Qu'est-ce qui ne va pas avec le calcul différentiel et intégral? Il est vrai que, dans bien des universités, le calcul s'enseigne surtout à un auditoire captif dont une grande partie ne cherche qu'à satisfaire aux exigences de son programme en y mettant le moins d'effort possible et sans risquer de compromettre sa moyenne. Pourtant, même le premier cours de calcul (norme ANSI) possède des caractéristiques fort intéressantes qu'un bon enseignant peut enrichir. Le problème, ce n'est pas l'apprentissage du calcul lui-même : c'est l'empressement à en finir le plus tôt possible.

De plus en plus d'écoles offrent des cours de calcul différentiel et intégral aux élèves de 12^e année. Paradoxalement, d'autres domaines des mathématiques, qui ne cadrent pas avec le curriculum, comme la géométrie euclidienne, sont presque totalement oubliés. La raison en est évidente : le calcul différentiel et intégral est habituellement le cours de mathématiques de base des facultés de sciences. Certains cours de calcul différentiel offerts au secondaire ne visent qu'à préparer les élèves à leurs cours de première année d'université. D'autres, comme les cours de reclassement (dans les classes supérieures) et les cours du baccalauréat international, sont destinés à les remplacer. Afin de recruter les meilleurs étudiants, les universités se voient contraintes d'offrir des équivalences pour ces cours, ainsi que pour d'autres cours semblables. En surchargeant un peu leur horaire et en suivant quelques cours d'été, les étudiants peuvent terminer un programme de quatre ans en trois années seulement. Compte tenu du coût des études et des perspectives de salaire à la sortie, l'incitatif financier est assez clair.

Mais est-ce qu'obtenir son diplôme plus tôt que prévu est vraiment une bonne chose? Les études de premier cycle

peuvent être ou ne pas être les plus belles années d'une vie; il reste que, lorsqu'on les termine, on n'y revient plus. Cela est aussi vrai pour le secondaire. Chaque établissement donne la chance à ses élèves de s'épanouir aux plans personnel et social, et d'obtenir la meilleure formation possible. Alors, pourquoi se presser d'en finir au plus vite?

Comme le chantait Joni Mitchell :

« Take your time, it won't be long now
Till you drag your feet to slow the circles down » [2]

Ne te presse pas, le moment viendra bien vite
Où tu essaieras de freiner le cours du temps [traduction libre]

Évidemment, chaque personne est unique, et ce qui vaut pour un étudiant ne vaut pas nécessairement pour un autre. Dans l'ensemble, toutefois, je pense que nous devrions encourager les étudiants doués à faire le maximum pendant qu'ils sont aux études, pas à en finir au plus vite. Réflexion faite, cela ne fera pas une très grande différence si les plus brillants mathématiciens de la nouvelle génération arrivent sur le marché du travail une année plus tôt. Ce qui pourrait par contre contribuer à changer le monde, ce serait qu'ils profitent de leurs talents pour approfondir leurs connaissances — en maths ou dans d'autres domaines — durant leurs études secondaires, collégiales ou universitaires.

D'où l'importance des activités d'enrichissement qui mettent l'accent sur l'approfondissement des matières et sur l'élargissement du champ de formation. Les clubs de mathématiques, les revues comme *Crux Mathematicorum*, les camps de mathématiques, les livres de maths pour tous, les sites web, les concours de maths, les postes d'assistant de recherche durant l'été : tout cela participe à ce que les jeunes génies des maths restent à l'école le plus longtemps possible et profitent de leurs années d'études de façon à en tirer le meilleur parti.

Comment pouvez-vous favoriser tout cela?

[1] www.artofproblemsolving.com

[2] Joni Mitchell, «The Circle Game», © Siquomb Publishing Co.

An Introduction to Operators on the Hardy-Hilbert Space

by Rubén A. Martínez-Avendaño and Peter Rosenthal,
Springer Verlag, 2007, xii+220 p. pp. US\$ 49.95
ISBN 978-0-387-35418-7

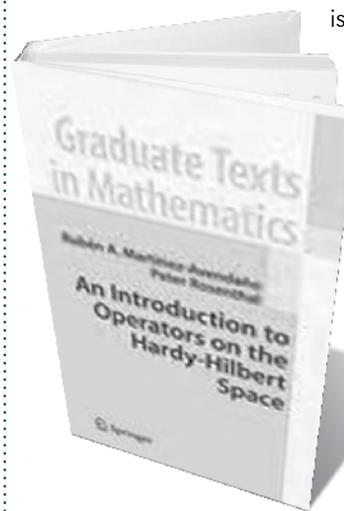
Review by Eric Nordgren, University of New Hampshire.

“An Introduction to Operators on the Hardy-Hilbert Space” by Rubén A. Martínez-Avendaño and Peter Rosenthal is a very nice account of some of the beautiful interplay between Hilbert space operator theory and complex function theory. This subject originated with the work of G. H. Hardy, F. Riesz, and, most notably, A. Beurling, who showed how knowledge of the structure of certain bounded analytic functions on the unit disc of the complex plane allows one to completely describe the invariant subspace structure of the unilateral shift operator. The point of view of the book is that the function theory and operator theory are integrally related and each one informs the other. The focus is primarily on the Hardy space H^2 rather than the whole range of H^p spaces so that Hilbert space operator techniques can be used as a principal technique.

The unilateral shift operator is the quintessential Hilbert space operator, and it can be viewed as acting on ℓ^2 by taking a square summable sequence of complex numbers and shifting each term one position to the right and finally inserting a zero to fill the now unoccupied first position. It is immediate that it is a bounded operator that preserves the norm, so it is injective, but its range consists of all sequences having a zero entry in the first position, so it is not surjective. Injective but not surjective, it exhibits properties not found in finite dimensions. Its range is, of course, an invariant subspace, i.e. a closed linear subspace that is mapped into itself by the operator.

By taking the range of the product of n copies of the shift operator one obtains the invariant subspace consisting of all sequences whose first n terms are all zero. Each natural number gives rise to such an invariant subspace, and together with the trivial subspaces $\{0\}$ and the entire space, one obtains a nest of immediately apparent invariant subspaces of the shift. In view of the analogy between the shift on ℓ^2 and a single Jordan block on a finite dimensional space (the matrix of zeros and ones where the ones fill the diagonal immediately below the main diagonal), it is not too improbable a conjecture that one has obtained all the invariant subspaces of the shift operator.

That the conjecture is in fact wrong can be seen most easily by switching to a function theoretic point of view. Associate to each sequence in ℓ^2 the power series with the sequence as Taylor coefficients to obtain a collection of analytic functions $f(z)$ on the unit disc in the complex plane. This isomorphic copy of ℓ^2 is the Hardy Hilbert space H^2 , and the unilateral shift in this context takes the form multiplication by the variable z . Evaluation of functions in H^2 at a point of the disc is a continuous linear functional whose kernel, the functions vanishing at the point,



is an invariant subspace of the shift. (The range of the shift, zH^2 , is obtained as the kernel of evaluation at 0.) Thus the function theoretic point of view clearly exhibits uncountably many invariant subspaces that were not initially evident.

To understand the remaining invariant subspaces one can profitably turn to Chapter two of the book under review. The 220 page book consists of six chapters followed by a 173 item bibliography plus notational, author and subject indices. Each

chapter is followed by a section of exercises and a section of notes and remarks which give some of the fascinating history of the results in the chapter and point to sources of additional information. The first chapter provides an introduction to the Hardy Hilbert space and a bit of background from functional analysis. The role of the L^2 space of functions on the unit circle as boundary functions of H^2 functions, the Poisson integral formula, and Fatou's Theorem are developed. There follows chapters, which will be discussed below, on the unilateral shift operator, on Toeplitz operators, on Hankel operators, and on composition operators. A short final chapter consists of suggestions for further reading.

In the second chapter shift operators, both forward and backward, appear on both ℓ^2 and $\ell^2(Z)$, the space of doubly infinite square summable sequences, and are naturally related to multiplication by z on H^2 and L^2 . Studying these operators, their spectra and their invariant and reducing subspaces, and more general multiplication operators, leads one into the study of various properties of H^2 functions. One meets Blaschke products and inner and outer functions, which are used in the canonical factorization of H^2 functions and in Beurling's theorem to describe the lattice of invariant subspaces of the shift and its cyclic vectors. A nice little side trip in this chapter derives the Müntz-Szász Theorem as a consequence of the Blaschke condition on zeros of H^2 functions.

The operator on L^2 of multiplication by a bounded measurable function ϕ on the unit circle has a matrix relative to the standard basis, $\{e^{in\theta} : n \in Z\}$, that is constant on diagonals parallel to the main diagonal, the constants being the Fourier coefficients of ϕ . Such matrices, whether doubly infinite as in this case, finite, or singly infinite are called Toeplitz matrices. An operator obtained by restricting a multiplication operator M_ϕ to H^2 and following the result by a projection onto H^2 is the Toeplitz operator T_ϕ , and its matrix relative to the basis $\{z^n : n \geq 0\}$ is the singly infinite Toeplitz matrix obtained by taking the lower right hand corner of the matrix of M_ϕ . The unilateral shift itself is such an operator T_z , and can be used to characterize the Toeplitz operators by the equation $T_z^* T_\phi T_z = T_\phi$.

continued page 24

Modeling Differential Equations in Biology

by Clifford H. Taubes,

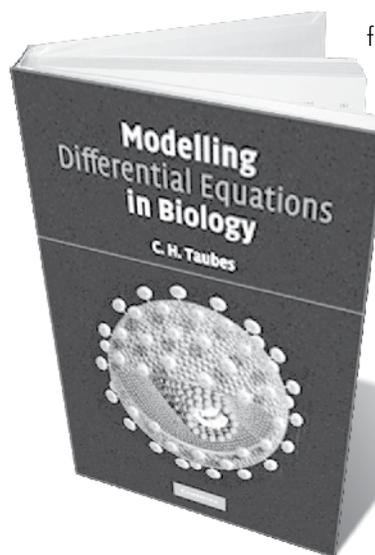
Cambridge University Press, 2008, xv + 500 pp. US \$60.00,
ISBN 978-0-521708432-2

Review by David Iron, Dalhousie University.

Until quite recently the roll of mathematics in biological research has been quite limited. Increased understanding of underlying biochemical mechanism, improved experimental methods and the study of interactions in complex ecosystems are rapidly altering this situation. The curriculum of most biology departments has been quite slow to address this fact though. This coupled with an almost universal reticence of biology students towards the study of mathematics has made it difficult to form productive working relationships between mathematicians and biologists. *Modeling Differential Equations in Biology* is based on a second year course for biology students given at Harvard which attempts to rectify this situation. It is a problem driven introduction to differential equations. The first chapters are focused on very basic topics such as exponential growth, equilibria, stability and systems. In the later chapters, advanced topics such as periodic solutions, pattern formation and travelling waves are covered. Each chapter concludes with one or more published papers illustrating the concepts of the chapter.

The first few chapters are at an appropriate level for the better second year biology students. The concepts of equilibria and stability are clearly explained. The text focuses on qualitative analysis rather than analytical solutions. When nonlinear systems are introduced, nullclines and field plots are used to study stability and bifurcations. For systems of two equations the eigenvalues of the Jacobian are used to determine stability, but there is no justification or explanation of why the given procedures work. There is a very useful discussion of mathematical models for advection and diffusion. All of the areas covered are illustrated with very clear examples and the applicability is demonstrated with reprinted articles from important journals.

The second half of the book is dominated by very advanced topics. I think that almost all second year biology students would be completely lost in the discussion of advanced topics such as pattern formation in nonlinear reaction diffusion systems, stability of periodic orbits, travelling waves and multiple time scale systems. Many of these topics are not seen by mathematics students until fourth year or the start of graduate school. I would advise anyone building a course based on this book to focus only on the first half and leave the second half



for better students who find the material interesting to explore in later years. However, this material would be very useful for biological researchers collaborating with mathematicians. The material is presented in a manner which requires very little mathematical background and an experienced and determined researcher should be able to follow everything.

In conclusion I would like to say this is a very well written book. I had no problem reading the entire text in a few days. Given that most biology students will take no more than one year of mathematics, I think that a second year course covering areas in the first half of the book is essential for anyone wishing to pursue a career as a researcher in biology. The second half of the book would be a very useful reference for a biological researcher who wishes to form collaborations with mathematicians. In fact I plan on buying a copy for someone I work with.

NOUVELLES DU DEPARTMENT

University of Ottawa, Ottawa, Ontario

Nominations : Vasilisa Shramchenko (Professeure adjointe, physique mathématique) s'est joint au département le 1er septembre 2008.

Visiteurs : Récemment, le département a accueilli les postdoctorants, étudiants stagiaires au doctorat et visiteurs de longue durée suivants : Sara Derivière (systèmes dynamiques, septembre 2005 à juillet 2008); Sonia Trepode (algèbre, mai et juin 2008); Diane Castonguay (algèbre, juin 2008); Patrick Le Meur (algèbre, juin et juillet 2008); Edson Ribeiro Alvares (algèbre, avril à juillet 2007); Yingbo Zhang (algèbre, mai à juillet 2007); David Smith (algèbre, depuis janvier 2008); Ryan Hoban (géométrie, août à décembre 2008); Yogesh Tripathi (statistique, décembre 2007 à août 2008); Mohammad Jafari Jozani (statistique, janvier à décembre 2008); Djilali Ait Aoudia (statistique, décembre 2006 à août 2007 et depuis septembre 2008).

Automorphic Forms and L-Functions for the Group $GL(n, R)$

by Dorian Goldfeld

Cambridge Studies in Advanced Mathematics 99, Cambridge
2006, xiii + 493pp. US\$90, ISBN 978-0-521-83771-2

The theory of L-functions and automorphic forms is an interesting subject going back to Gauss, Dirichlet and Riemann. An L-function is a Dirichlet series $\sum_{n=1}^{\infty} \frac{a_n}{n^s}$ where the coefficients $a_n, n=1, 2, \dots$ are number theoretic functions. A simple example is where a_n is the number of representations of n as a sum of two squares. When we consider this series as an analytic function of s , we can obtain deep knowledge about the statistical distribution of the values of a_n . An automorphic form is a function that satisfies a differential equation and also satisfies a group of periodicity relations. An example is given by the exponential function $f(x) = e^{2\pi i x}$ which is periodic (it has the same value under the transformation $x \rightarrow x + 1$) and it satisfies the differential equation $\frac{d^2 f}{dx^2} = -4\pi^2 f$. In this example the group of periodicity relations is just the infinite additive group of integers. Remarkably, a vast theory has been developed exposing the relationship between L-functions and automorphic forms associated to various infinite dimensional Lie groups such as $GL(n, R)$. The theory is explained by simple, fully worked out examples. The discussion is restricted to the action of the discrete group $SL(n, Z)$, of invertible $n \times n$ matrices with integer coefficients, acting on $GL(n, R)$; the cases $n=2$ and 3 are treated before discussing the general case. Definitions are repeated so that any page can be read without having to backtrack. The final chapter gives a description of Langlands conjectures. An appendix provides a set of Mathematica functions in the $GL(n)$ pack Manual so that the reader can explore the theory from a computational point of view.

Central Simple Algebras and Galois Cohomology

by Philippe Gille and Tamás Szamuely

Cambridge Studies in Advanced Mathematics 101, Cambridge
2006, xii + 343pp. US\$80, ISBN 978-0-521-86103-8

A finite dimensional algebra A over a field k is called simple if it has no (two-sided) ideal other than 0 and A . The algebra A is central if its centre is k itself. Any division algebra over k is simple. The first chapter of the book begins with a discussion of generalized quaternion algebras. With each quaternion algebra, a conic is associated with the property that the conic has a k -point if the algebra splits over k . This correspondence is generalized to arbitrary dimension: Associated with each central simple algebra A of degree n over k is a projective k -variety X of dimension $n - 1$ which has a k -point if A splits. To prepare for this a couple of chapters are devoted to developing the theory of central simple algebras using methods of Galois theory, especially Galois descent, Galois cohomology, cohomological Brauer group and the Galois symbol. The varieties X are called the Severi-Brauer varieties; a chapter is devoted to studying them. Residue maps arise in the computation of Brauer groups of function fields or power series fields; these are studied with applications to class field theory in a separate chapter. A chapter is devoted to Milnor's K -theory. It is followed by a chapter on the central result of the book: the celebrated theorem of Merkurjev and Suslin on the bijectivity of the Galois Symbol, i.e.,

$$h_{k,m}^2 K_2^M(k)/m \rightarrow H^2(k, \mu_m^{\otimes 2})$$

is an isomorphism for every $m \geq 2$ and every field k whose characteristic does not divide m . The book is suitable as a text for graduate students and as a reference for researchers in algebra, algebraic geometry or K -theory.

Langlands Correspondence for Loop Groups

by Edward Frenkel

Cambridge Studies in Advanced Mathematics 103, Cambridge
2006 xvi + 379pp. US\$85, ISBN 978-0-521-85443-6

In the 1960s Robert Langlands put forth a series of conjectures on the possible connection among diverse areas presenting a vision of mathematics as a unified whole. Known as the Langlands program, it weaves seemingly unrelated disciplines such as Number Theory and Automorphic Representations, Geometry and Quantum Field Theory, etc, into a web of tantalizing conjectures. Andrew Wiles' proof of Fermat's Last Theorem provides a partial but substantial realization of it since the tools required for the proof are arithmetic theory of elliptic curves, modular forms, Galois representations and their deformations developed by many mathematicians. The Langlands correspondence manifests itself in a variety of ways in diverse areas of mathematics and physics, but the same salient features, such as the appearance of the Langlands dual group, are always present. Edward Frenkel presents in this book a systematic and self-contained introduction to the local geometric correspondence for loop groups and the related representation theory of the affine Kac-Moody algebras. Many of the results are first explained in the context of the simplest case of SL_2 . No background beyond that of college algebra is required of the reader except in the last chapter on constructing the Langlands correspondence. A quick review of Lie algebras and Kac-Moody algebras is provided in an Appendix. Based on courses taught by the author at UC, Berkeley, the book contains open problems which could form the basis for future research.

Markov Processes, Gaussian Processes, and Local Times

by Michael B. Marcus and Jay Rosen

Cambridge Studies in Advanced Mathematics 100, Cambridge
2006, x + 620pp. US\$90, ISBN 978-0-521-86300-1

The authors say that a more descriptive title for the book would be: "A study of the local times of strongly symmetric Markov Processes employing isomorphisms that relate them to certain associated Gaussian Processes." Thus the book provides (i) a self-contained development of the Markov process theory, (ii) some sophisticated results about the sample path properties of Gaussian processes to obtain similar sample path properties of associated local times, (iii) some properties of Gaussian processes that are not usually featured in standard texts such as processes with spectral densities or those that have infinitely divisible squares, (iv) some new results on Gaussian processes, and (v) isomorphism theorems of Dynkin and Eisenbaum that relate the local times of strongly symmetric Markov processes to associated mean zero Gaussian processes. Written by two of the foremost researchers in the field, the book will be useful to both researchers and advanced graduate students.

Report from ICME-11

Peter Taylor, Queens University
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I have just returned from ICME-11 in Monterrey, Mexico. It was a huge conference with between 3000 and 4000 delegates from almost all the 84 member countries. I did not get an accurate count of the number of Canadians, but I encountered no fewer than 30. Many of these took part in the program, either in topic or discussion groups, and we had three regular lecturers, Carolyn Kieran, Louise Poirier, and Christiane Rousseau.

I attended the meeting of the General Assembly on the day before the conference opened. This is essentially the governing body of ICMI (International Commission on Mathematical Instruction); it consists of one representative from each country along with the thirteen members of the Executive Committee. One of the main items of business was the election of the new Executive Committee to serve for three years from January 1, 2010 until the end of 2012. This was an historic occasion in that it was the first time it was elected by the ICMI General Assembly rather than by IMU (International Mathematical Union). The results are:

President: **William (Bill) Barton** (New Zealand)

Secretary-General: **Jaime Carvalho e Silva** (Portugal)

Vice-Presidents: **Mina Teicher** (Israel) and **Angel Ruiz** (Costa Rica)

Members-at-large:

Mariolina Bartolini Bussi (Italy)

Sung Je Cho (Korea)

Roger Howe (USA)

Renuka Vithal (South Africa)

Zhang Yingbo (China)

In particular, Bernard Hodgson, of Laval University, will step down as Secretary-General at the start of 2010. This completes a mammoth 11-year term for Bernard, a period in which Canada gained a prominent position on the ICMI map.

At the meeting, a number of current issues were discussed. Committee reports were received as well as reports from current or upcoming ICMI studies. A few countries gave presentations (this year, it was France, Korea, South Africa and USA). Reports on most of these happenings will appear in the ICMI newsletter, but I will mention a few that struck me. By the way, if you do not receive the online ICMI newsletter, and would like to, visit <http://www.mathunion.org/mailman/listinfo/icmi-news> and sign up.

1. Efforts are being made to have more mathematics education journals in the Citation Index, as the CI now seems to be commonly used in the calculation of research impact factors.

2. There was discussion of the continued financial health of ICMI which current loses about \$7000 per year. One idea was to exact dues for participation in the General Assembly from non-member countries.

3. Another significant issue was the promotion of mathematics education in developing countries. This is a joint enterprise with IMU.

4. Another joint IMU/ICMI project is the *Pipeline Project* dealing with issues of supply and demand in teaching and the workplace for graduates of mathematics programs. In recent years, IMU raised the concern of declining numbers of students choosing to pursue mathematics at the university level. This seems to be a worldwide trend over the past decade, and is a concern to a wide range of professionals, not only mathematicians. A related problem, of course, is the inadequate supply of qualified students entering mathematics teacher programs. IMU enlisted ICMI to help them gather data, so that at the beginning we have some idea of the real dimensions and locus of the problem. Such data has proved hard to gather and it was decided to mount an extensive study of six countries: Australia, Finland, France, New Zealand, Portugal and USA.

I am happy to answer any questions.

Peter Taylor is the Canadian representative in the General Assembly of ICMI.

Invitation

We are pleased to receive from readers any information about mathematics education to be included in these *Notes* in either English or French. There are a number of types of items that are particularly welcome:

(a) Those who attended ICME-11 in the summer are invited to contribute their impressions of the meeting. What did you find that was particularly significant, newsworthy or novel about mathematics education?

(b) You are encouraged to send news of new initiatives in your graduate or undergraduate program, and to report on activities that you found to be particularly successful or unsuccessful.

(c) We would like to include news (with a photograph) about any teaching awards or other educational honours received by your colleagues.

(d) What outreach activities to school students and teachers have people in your department been involved in? Have you been involved in curricular developments?

(e) What are your views on mathematics as an ancillary subject for programs such as engineering, economics and biology?

(f) Does your department provide for independent research by students at the pre-thesis level in either undergraduate or early graduate study? What are the details and how successful have they been?

(g) We would very much like to receive from undergraduate

and graduate students thoughtful comments about aspects of their mathematics education they found particularly helpful or inspiring; please encourage some of your students to think about their mathematical education and analyze their response to it.

Please submit material to the education editor, Ed Barbeau, at barbeau@math.utoronto.ca.

Patterns in mathematics

It is quite popular for elementary students to be presented with some *ad hoc* numerical sequence and ask for the next term, on the grounds that it is good to teach children to look out for patterns. To be sure, the ability to observe and exploit patterns is a useful assist to mathematical success; however, it is not necessary to use low-quality “guess-the-rule-I-happen-to-have-in-mind” examples. I have found that there are many natural situations that engender patterns that can be used as the basis of conjectures and, for more advanced students, occasion for proof.

Most students are exposed to pythagorean triples. It is not too hard for many of them to look at the examples (3, 4, 5), and (5, 12, 13), and figure out how to generate indefinitely many for which the highest two numbers differ by 1. However, there are some for which the smallest two numbers differ by 1, such as (3, 4, 5), (20, 21, 29). Can more be found? With some effort (and perhaps the use of a pocket calculator), pupils may hit upon (119, 120, 169). How can more be found? The validity of a pythagorean triple can be checked by factoring as a difference of squares. Thus $5^2 - 4^2 = 1 \times 9 = 1^2 \times 3^2$, $29^2 - 20^2 = 3^2 \times 7^2 = 21^2$ and $169^2 - 120^2 = 7^2 \times 17^2 = 119^2$. Further exploration may lead to the observations that $5 = 1^2 + 2^2$, $29 = 2^2 + 5^2$, $169 = 5^2 + 12^2$ while $3 = 1 + 2$, $7 = 2 + 5$, $17 = 5 + 12$. From this, the pupils may be able to see how to find other triples in the family. When children get warmed to the idea that there are interesting things to be found, then it is remarkable how far they can go.

The triple 3, 8, 21 have the property that $3 \times 8 + 1$, $3 \times 21 + 1$ and $8 \times 21 + 1$ are all squares (of 5, 8, 13). Can other triples (a, b, c) be found for which $ab + 1$, $bc + 1$, $ca + 1$ are all squares? Can it be arranged that a, b, c are in arithmetic progression? Since the numbers can be small, many examples can be found empirically and then generalizations determined. Some families of triples are given by $(k-1, k+1, 4k)$, $(1, k^2-1, k^2+2k)$, $(f_{2n-2}, f_{2n}, f_{2n+2})$ (where $\{f_n\}$ is the Fibonacci sequence with $f_0 = 0$, $f_1 = 1$) and $(a_n, 2a_{n+1}, a_{n+2})$, where $a_0 = 1$, $a_1 = 4$ and $a_{n+2} = 4a_{n+1} - a_n$ for $n \geq 0$.

Pell's equation is a fine generator of patterns. For example, $x^2 - 3y^2 = 1$ has solutions $(x, y) = (1, 0), (2, 1), (7, 4), (26, 15)$, all of which can be found empirically. Pupils might be able to use the information available to get the next higher solutions, (97, 56) and (362, 209). Those who are familiar with squares might note that 2, 26 and 362 all exceed perfect squares by 1 and be led to investigate whether there is any significance to the

roots of these squares.

The final example (due, I believe, to Donald Knuth) is one that can be used at the middle or secondary level, as the method of generating the sequence is a little intricate. However, when the sequence is being generated, it becomes easy for students to surmise whether they are on the right track. The sequence provides an enumeration of the nonnegative rationals, and students might try to predict when particular rationals they may propose get picked up by the sequence.

For the positive integer n , let $p(n) = k$ if n is divisible by 2^k but not by 2^{k+1} . Let $x_0 = 0$ and define x_n for $n \geq 1$ recursively by

$$\frac{1}{x_n} = 1 + 2p(n) - x_{n-1}.$$

Unlike many of the examples provided by mathematics educators, these arise in context, and so students can test for themselves the validity of their guesses by checking whether they are suitable to the purpose. In some situations, the general patterns can be checked with basic algebra, so that there is the opportunity for students to get experience with proofs other than through geometry. If an inductive process is involved in moving from one instance of a pattern to the next, then the groundwork can be laid for an understanding of proof by induction.

In addition, a sufficiently rich pattern indicates the fecundity of mathematics. An answer by one student does not end the discussion as other students may notice additional properties. It may happen that separate properties can be comprised within a more general observation. Thus, students may in the end learn a lot about mathematics that they would not be able to pick up through the standard syllabus.



Letters to the Editors Lettres aux Rédacteurs

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

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

NEW Publications *from the AMS*

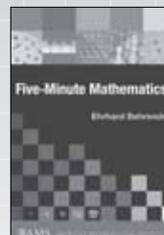
Five-Minute Mathematics

Ehrhard Behrends, *Freie Universität Berlin, Germany*

Translated by David Kramer

Engaging and entertaining vignettes that demonstrate how mathematics is essential to understanding our everyday world

2008; 380 pages; Softcover; ISBN: 978-0-8218-4348-2; List US\$35; AMS members US\$28; Order code MBK/53



Lectures on Surfaces

(Almost) Everything You Wanted to Know about Them

Anatole Katok and Vaughn Climenhaga, *Pennsylvania State University, University Park, PA*

Student Mathematical Library, Volume 46; 2008; approximately 303 pages; Softcover; ISBN: 978-0-8218-4679-7; List US\$49; AMS members US\$39; Order code STML/46

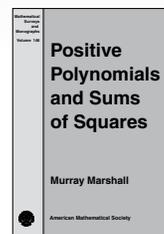


Positive Polynomials and Sums of Squares

Murray Marshall, *University of Saskatchewan, Saskatoon, SK, Canada*

An elementary introduction to a fundamentally important subject bringing together algebra, geometry and analysis

Mathematical Surveys and Monographs, Volume 146; 2008; 187 pages; Hardcover; ISBN: 978-0-8218-4402-1; List US\$65; AMS members US\$52; Order code SURV/146



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Kenji Ueno, *Kyoto University, Japan*

The first book to introduce conformal field theory with gauge symmetry at a comparably accessible level

Titles in this series are co-published with The Fields Institute for Research in Mathematical Sciences (Toronto, Ontario, Canada).

Fields Institute Monographs, Volume 24; 2008; 168 pages; Hardcover; ISBN: 978-0-8218-4088-7; List US\$59; AMS members US\$47; Order code FIM/24



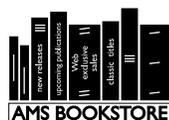
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**CMS Winter Meeting 2008
Marriott Hotel, Ottawa (Ontario)
December 6 – 8
www.cms.math.ca
Host: Carleton University**

Meeting Directors: Matthias Neufang and Benjamin Steinberg (Carleton)

On behalf of Carleton University (www.carleton.ca), the School of Mathematics and Statistics invites the mathematical community to the CMS Winter Meeting 2008. The program will include eleven plenary, prize and public lectures, and a wide variety of sessions, including a Contributed Paper session.

All scientific talks and social activities will take place at the **Ottawa Marriott Hotel, located at 100 Kent Street, Ottawa.**

The CMS Committee for Women in Mathematics is organizing the 4th workshop of **Connecting Women in Mathematics Across Canada (CWIMAC 2008)**. The purpose of the CWiMAC workshops is to support the career development of junior female academics in the Canadian mathematics community. CWiMAC 2008 will take place at the University of Ottawa on December 4 and 5, 2008.

Prizes and Awards

Coxeter-James Prize - Ravi Vakil (Stanford University)
 Doctoral Prize - Matthew Greenberg (Calgary)
 Adrien Pouliot Award - Harley Weston (Regina)
 G. de B. Robinson Award - to be announced
 David Borwein Distinguished Career Award - Hermann Brunner (Memorial)

Plenary Speakers

David Acheson (Oxford)
 Fan Chung (UC San Diego)
 Gilles Godefroy (Paris)
 Sorin Popa (UCLA)
 Laurent Saloff-Coste (Cornell)
 Mark Sapir (Vanderbilt)
 Keith Taylor (Dalhousie)

Public Lecture

Patrick Hayden (McGill)

Business Meetings

Executive Committee Meeting: Thursday, December 4; Marriott, Sussex Room
 Development Group Luncheon: Friday, December 5; Marriott, Laurier Room
 Board of Directors Meeting: Friday, December 5; Marriott, Cartier III Room

Social Events

Welcoming Reception: Friday, December 5; Marriott
 Banquet: Saturday, December 6; Marriott, Ballroom
 Complimentary coffee and juice will be available during the scheduled breaks.

Registration

The registration form is available at www.cms.math.ca/Events.

Registration fees are given in Canadian dollars. Payment may be made by cheque (Canadian or US dollars), or by VISA or MasterCard. Receipts will be provided at the meeting.

The Early Registration deadline has been extended to October 15.

	ONLINE		ONSITE
	Early rate until Sep 30	Regular rate Oct 1 - Nov 25	
Prize Lecturer (incl. 2 free banquet tickets)	\$ 0	\$ 0	\$ 0
Plenary, Public Lecturer (incl. 1 free banquet ticket)	\$ 0	\$ 0	\$ 0
Students	\$95	\$125	\$150
Postdoc, Retired, K-12 Teachers, Unemployed	\$150	\$175	\$200
CMS members, Organizers, Speakers	\$295	\$345	\$395
Non-Members	\$445	\$495	\$545
One-day fee (onsite only)	-	-	\$175
Banquet ticket	\$ 60	\$ 60	\$ 60

Advantages to Pre-Registration:

- Your name appears on the list of participants on the meeting web site
- Your Meeting Package is waiting for you at the reception on Friday evening
- No waiting in line early Saturday morning to process your registration!
- Banquet tickets are available now but may no longer be available on site

Refund Policy

Participants wishing to cancel their registration must notify the CMS (meetings@cms.math.ca) in writing by November 25 to receive a refund less a \$40 processing fee. Those whose contributed paper has not been accepted will upon request be fully refunded.

Submission of Abstracts

For abstracts of talks to be published on-line and in the meeting programme, they have to be submitted by October 15, 2008, using the on-line form at cms.math.ca/forms/abs-w08. The organizers appreciate the cooperation of all speakers in observing this important deadline.

Accommodation

The hotel listed below is offering rooms at a reduced group rate during the conference as well as three days prior and three days after the conference. To be eligible for the reduced room rates, participants must make their reservations before the date indicated, quoting the group code. Reservations made after the deadline will be on a space available basis and the group rate may no longer apply.

Rates are per room per night and are quoted in Canadian dollars. Reservations must be guaranteed by a one-night deposit or a major credit card. It is recommended to clarify payment and cancellation policies when making the reservation, as these vary from hotel to hotel.

Ottawa Marriott Hotel (www.ottawamarriott.com)
100 Kent Street, Ottawa, ON, K1P 5R7
Phone: 613-238-1122 or 1-800- 853 8463, Fax: 613-783-4229

All meeting participants who complete their hotel booking at the Marriott Hotel by October 31 will be entered into a draw for the following prizes:

- One complimentary Sunday Brunch for two in the Merlot Rooftop Grill
- One complimentary Dinner for two in the Toulouse Restaurant
- One complimentary one night weekend stay at the Marriott Hotel

Booking deadline: November 4, 2008

Group code: CMSCMSA

Rates:

Room rate includes high-speed internet access and complimentary local phone calls.

Traditional Guest Room (two double beds or one king size bed) - \$139

Single or double occupancy; \$10 for each additional person for triple and quadruple occupancy.

Applicable taxes: 5% GST (refundable to non-residents of Canada), 6% Provincial Sales Tax, 3% Destination Marketing Fee.

No pets are allowed in the guest rooms

Hotel provides a 100% smoke-free environment

Children under 18 may stay for free in their parent's room.

Child care can be arranged through the front desk.

Parking: Self-parking: \$20 per day \$6 per hour; Valet-parking: \$25 per day

Check-in: 3:00 pm

Check-out: 1:00 pm

For student accommodation, please contact the Meetings Coordinator at meetings@cms.math.ca.

Travel

A taxi fare from the airport to downtown costs approximately \$25.

The fare for the shuttle bus is \$8 one-way and \$16 return. This is a special group rate, please identify yourself as a participant of this conference when you purchase the ticket. The regular rate is \$14 one way and \$24 return. A schedule is available at www.yowshuttle.com.

Detailed information regarding Carleton University, the city of Ottawa, and the province of Ontario including tourism information, local weather and climate, site and street maps, and itineraries for self-guided tours, are available at the

following websites:

- Carleton University (www.carleton.ca)
- Ottawa Tourism (www.ottawatourism.ca)
- Ontario Travel (www.ontariotravel.net)
- Canada Weather Forecast (www.weatheroffice.ec.gc.ca)

Graduate Student Travel Support

Limited funds are available to partially fund the travel and accommodation costs for bona fide graduate students at a Canadian or other university. Preference is given to Canadian students. To apply for this funding, applicants should submit a letter written by their supervisor or departmental graduate advisor, providing the following: name of student, area of study and level, how the student will benefit from the meeting, whether or not the student be speaking, and what support is available from other sources.

This letter should be sent before October 15, 2008 to gradtravel-w08@cms.math.ca. Applicants will be notified in late October of the funding decision.

If successful, the student will receive a cheque for reimbursement of expenses after the meeting and upon completion and submission of the standard Travel Expense Claim Form, along with appropriate original receipts.

For more information, please contact the Meeting Committee at gradtravel-w08@cms.math.ca.

For Student accommodation, contact the Meeting Coordinator (meetings@cms.math.ca).

Exhibits

Exhibits will be open from 9:30 am to 4:00 pm on Saturday and Sunday in the Victoria South Room.

The Joint Exhibit features books and other products from publishers and other companies and organizations not represented at the meeting. Order forms will be available at the exhibit for your convenience. We will forward any orders to the corresponding company after the meeting. Books and other materials that will be displayed at this Joint Exhibit will be donated to the host university.

We invite participants to visit the CMS Membership Booth and Book Display, located in the registration area. A representative will be available from 9:30 am to 4:00 pm to answer questions about membership, publications, and other programs.

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.

- le Centre de Recherches Mathématiques
- The Fields Institute
- MITACS
- Pacific Institute for the Mathematical Sciences
- Carleton University
- Dean of Science
- Vice President, Research
- Vice President, Academics

The Canadian Mathematical Society wishes to acknowledge the contributions of the Meeting Directors and the Session Organizers.

SESSIONS

Algebraic Combinatorics

Combinatoire algébrique

Org: François Bergeron, Srećko Brlek, Christophe Hohlweg, Christophe Reutenauer (UQAM)

Nantel Bergeron (York), Ira Gessel (Brandeis), Janvien Nzeutchap (Fieldas), Alex Postnikov (MIT).

Algorithmic Mathematics

Mathématiques Algorithmiques

Org: Prosenjit Bose, Evangelos Kranakis (Carleton)

Stephane Durocher (Waterloo), Paola Flocchini (Ottawa), Constantinos Georgiou (Toronto), Michel Paquette (Carleton).

Applied Partial Differential Equations

Equations aux Dérivées Partielles Appliquées

Org: David Amundsen (Carleton), Lucy Campbell (Carleton), Francis Poulin (Waterloo)

Yves Bourgault (Ottawa), John Bowman (Alberta), Paul Choboter (California Polytechnic), Serge D'Alessio (Waterloo), Michael Haslam (York), Nicholas Kevlahan (McMaster), Boualem Khouider (Victoria), Greg Lewis (UOIT), Emmanuel Lorin (UOIT), Ming Mei (Champlain College; McGill), Abbas Momeni (Queen's), Arian Novruzi (Ottawa), Chun Hua Ou (Memorial), Francis Poulin (Waterloo), Bartosz Protas (McMaster), Marek Stasna (Waterloo), Gordon Swaters (Alberta), Michael Waite (Victoria).

Banach Spaces

Espaces de Banach

Org: Robb Fry (Thompson Rivers), Srinivasa Swaminathan (Dalhousie)

Razvan Anisca (Lakehead), Maxim Burke (Prince Edward Island), Stephen Dilworth (South Carolina), Petr Hajek (Czech Mathematical Inst.), Nigel Kalton (Missouri), Lee Keener (UNBC), Edward Odell (Texas - Austin), Thomas Schlumprecht (Texas A&M), Richard Smith (Czech Mathematical Inst.), Thomas Stromberg (Lund U., Sweden).

Combinatorics

Combinatoire

Org: Daniel Panario, Brett Stevens (Carleton)

Ada Chan (York), Clement lam (Concordia), Charlie Colburne (Arizona State), Peter Dukes (Victoria), Zhicheng Gao (Carleton), Penny Haxell (Waterloo), Jeannette Janssen (Dalhousie), Karen Meagher (Regina), Lucia Moura (Ottawa), Reza Naserasr (Carleton), Alex Rosa (McMaster), Frank Ruskey (Victoria), Mateja Sajna (Ottawa), Doug Stinson (Waterloo), Cathy Yan (Texas A&M), Joe Yucas (Southern Illinois), Wenan Zang (Hong Kong).

Commutative Algebra and Algebraic Geometry

Algèbre Commutative et Géométrie Algébrique

Org: Sara Faridi (Dalhousie), Anthony V. Geramita (Queen's)

Tristram Bogart (Queen's), Ragnar-Olaf Buchweitz (Toronto), Enrico Carlini (Politecnico di Torino), Jaydeep Chipalkatti (Manitoba), Brian Coolen (St. Francis Xavier), Susan Cooper (California Polytechnic State U.), Kia Dalili (Missouri), Laura Ghezzi (CUNY), Tai Huy Ha (Tulane), Brian Harboure (Nebraska), Graham Leuschke (Syracuse), Juan Migliore (Notre Dame), Claudia Miller (Syracuse), Peter Russell (McGill), Yong-Su Shin (Sungshin Women's U.), Greg Smith (Queen's), Mike Stillman (Cornell), Will Traves (US Naval Academy), Adam Van Tuyl (Lakehead), Fabrizio Zanello (Michigan Technological U.).

Cryptography and Coding Theory

Cryptographie et théorie des codes

Org: Isabelle Déchène, Ariane Masuda, Monica Nevins

Robert Bailey (Carleton), Mark Bauer (Calgary), Michael Jacobson (Calgary), David Jao (Waterloo), Atefeh Mashatan (Waterloo), Kumar Murty (Toronto), Daniel Panario (Carleton), Mohammad Sadeghi (Amirkabir U. of Technology), Renate Scheidler (Calgary), Éric Schost (Western), Francesco Sica (Mount Allison), Edlyn Teske (Waterloo).

Dynamics of Large Groups and Semigroups

Propriétés dynamiques des groupes et des demi-groupes de dimension

Org: Stefano Ferri (Universidad de los Andes), Alica Miller (Louisville), Vladimir Pestov (Ottawa)

Christopher Atkin (Victoria U. of Wellington), Alexander Berenstein (Uniandes, Bogotá), Ilias Farah (York), Stefano Ferri (Uniandes, Bogotá), Matthew Foreman (California-Irvine), Jorge Galindo (Jaume I, Castelló), Wojciech Jaworski (Carleton), Claude Laflamme (Calgary), Gabor Lukacs (Manitoba), Jan Pahl, Vladimir Pestov (Ottawa), Norbert Sauer (Calgary), Lionel Nguyen Van Thé (Calgary).

Geometric Group Theory

Théorie géométrique des groupes

Org: Inna Bumagin (Carleton), Denis Serbin (McGill), Benjamin Steinberg (Carleton)

Peter Brinkmann (City College - CUNY), Montserrat Casals-Ruiz (McGill), Sean Cleary (City College - CUNY), Tullia Dymarz (Yale), Bob Gilman (Stevens Inst. of Technology), Susan Hermiller (U. Nebraska Lincoln), Ilya Kazachkov (McGill), Olga Kharlampovich (McGill), Eduardo Martinez-Pedroza (McMaster), John Meier (Lafayette College), Alexei Miasnikov (McGill), Andrei Nikolaev (McGill), Denis Osin (City College - CUNY), Alexandra Pettet (Stanford), Akbar Rhemtulla (Alberta), Mahmood Sohrabi (Carleton), Zoran Sunik (Texas A&M), Nickolas Touikan (McGill), Alexander Ushakov (Stevens Inst. of Technology).

History and Philosophy of Mathematics

Histoire et philosophie des mathématiques

Org: Tom Archibald (SFU), Alexander Jones (Toronto)

Infinite-Dimensional Lie Theory

Théorie infini-dimensionnelle de Lie

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

Mathematical Aspects of Quantum Information

Aspects mathématiques de l'information quantique

Org: David Kribs (Guelph)

Mathematical Education

L'éducation mathématique

Org: Benoit Dionne (Ottawa), John Poland (Carleton)

Santo D'Agostino (Brooks), Bernard R. Hodgson (Laval), Leo Jonker (Queen's), Miroslav Lovric (McMaster), David Poole (Trent), Margaret Sinclair (York), Denis Tanguay (UQAM).

Mathematical Biology

Biologie mathématique

Org: Frithjof Lutscher, Robert Smith? (Ottawa)

Troy Day (Queen's), Gerda de Vries (Alberta), David Fisman (Hospital for Sick Kids), Jing Li (Western), Justine GunOg Seo (Ottawa), Robert Smith? (Ottawa), Rebecca Tyson (UBC Okanagan).

Mathematics and Classical Mechanics

Mathématique et mécanique classique

Org: Manuele Santoprete, Cristina Stoica (Wilfrid Laurier)

Stephen Anco (Brock), Larry Bates (Calgary), Leo Butler (Edinburgh), Monica Cojocaru (Guelph), Florin Diacu (Victoria), Antonio Hernandez-Garduno (Universidad Nacional Autónoma de México), Jacques Hurtubise (McGill), Jeroen Lamb (Imperial College), Bill Langford (Guelph), Ray McInenaghan (Waterloo), Dan Offin (Queen's), George Patrick (Saskatchewan), Gareth Roberts (College of the Holy Cross), Roman Smirnov (Dalhousie).

Number Theory

Théorie des nombre

Org: Alina C. Cojocaru (Illinois-Chicago), Damien Roy (Ottawa)

Nils Bruin (SFU), Stephen Choi (SFU), Alina C. Cojocaru (Illinois at Chicago), Chantal David (Concordia), Stephen Kudla (Toronto), Ram Murty (Queen's), Michael Rubinstein (Waterloo), Kenneth Williams (Carleton).

Numerical Analysis and Computational Mathematics

Analyse numérique et mathématiques computationnelles

Org: A. Bass Bagayogo (Collège Universitaire de Saint-Boniface)

Julien Arino (Manitoba), Tony Drummond (Lawrence Berkeley Lab.), Jun Li (Montreal), Sherry Li (Lawrence Berkeley Lab.), Emmanuel Lorin (UOIT), Joel Malard (SIMUCAD), Christian Perret (ETH Zurich), Damian Rousson (Sandia National Lab.), Chris Rycroft (Berkeley).

Operator Algebras

Algèbres d'opérateurs

Org: Benoit Collins, Thierry Giordano (Ottawa)

Serban Belinschi (Saskatchewan), Berndt Brenken (Calgary), Richard Burstein (Ottawa), Man-Duen Choi (Toronto), Ken Davidson (Waterloo), George Elliott (Toronto), Heath W. Emerson (Victoria), Juliana Erlijman (Regina), Remus Floricel (Regina), David Kerr (Texas A&M), Masoud Khalkhali (Western), Claus Koestler (St Lawrence College), James Mingo (Queen's), Ping Wong Ng (Louisiana-Lafayette), Alexandru Nica (Waterloo), Jonathan Novak (Queen's), Emily Peters (UC Berkeley), John Phillips (Victoria), Volker Runde (Emonton).

Probability

Probabilité

Org: Org: Antal Jaraí (Carleton; Bath, UK) and Yiqiang Zhao (Carleton)

Omer Angel (Toronto), Raluca Balan (Ottawa), David Brydges (UBC), Lung-Chi Chen (UBC), Miklos Csorgo (Carleton), Don Dawson (Carleton), Pierluigi Falco (UBC), Shui Feng (McMaster), Minyi Huang (Carleton), Gail Ivanoff (Ottawa), Xiaoyue Jiang (Louisiana State U.), Michael Kozdron (Regina), Rafal Kulik (Ottawa), Neal Madras (York), David McDonald (Ottawa), Mathieu Merle (UBC), Edwin Perkins (UBC), Lea Popovic (Concordia), Jeremy Quastel (Toronto), Wei Sun (Concordia), Barbara Szyszkowicz (Carleton), Adam Timar (UBC), Xiaowen Zhou (Concordia).

Representation Theory of Algebras

La théorie des représentations des algèbres

Org: Vlastimil Dlab (Carleton), Ragnar-Olaf Buchweitz (Toronto)

Yu A. Bachturin (Memorial), Margaret Beattie (Mount Allison), Frauke M. Bleher (Iowa), Christopher Brav (Queen's), Ragnar-Olaf Buchweitz (Toronto), Vlastimil Dlab (Carleton), Francois Huard (Bishop's), Shiping Liu (Sherbrooke), Frank Marko (Pennsylvania State-Hazleton), Frank Okoh (Wayne State), Frank Zorzitto (Waterloo).

Technology Use in Post-Secondary Mathematics Instruction: Issues in Practice and Research

Utilisation de la technologie dans l'enseignement mathématique post-secondaire

Org: Chantal Buteau (Brock), Daniel Jarvis (Nipissing), Zsolt Lavicza (Cambridge, UK)

Peter Adamic (Laurentian), Jack Weiner & Jeremy Balka (Guelph), Robert Billinski (Collège Montmorency), Zsolt Lavicza (Cambridge, UK), Panel Discussion, France Caron & Kathleen Pineau (Montréal & École de technologie supérieure), Margarita Kondratieva & Oana Radu (Memorial), Yvan Saint-Aubin (Montréal), Philippe Etchecopar & Jean-Philippe Villeneuve (Cégep de Rimouski).

Panel Discussion: France Caron (Montreal), Zsolt Lavicza (Cambridge, UK), Yvan Saint-Aubin, (Montreal), Keith Taylor (Dalhousie)

Theory and Applications of Functional Differential Equations

Théorie et applications des équations différentielles fonctionnelles

Org: Pietro-Luciano Buono (UOIT), Victor LeBlanc (Ottawa)

Jacques Belair (Montréal), Elena Braverman (Calgary), Sue Ann Campbell (Waterloo), Yuming Chen (Wilfrid Laurier), Teresa Faria (Universidade de Lisboa, Portugal), Qingwen Hu (York), Tony Humphries (McGill), Jeroen Lamb (Imperial College London, UK).

Contributed Papers

Communications libres

Org: Jim Pandey (Carleton)

Réunion d'hiver de la SMC 2008

**Hôtel Marriott
Ottawa (Ontario)
6-8 décembre
www.smc.math.ca**

Hôte : Université Carleton

Directeurs de la réunion : Matthias Neufang et Benjamin Steinberg (Carleton)

Au nom de l'Université Carleton (www.carleton.ca), l'école de mathématiques et de statistique invite la communauté mathématique à la Réunion d'hiver 2008 de la Société mathématique du Canada (SMC). Au programme : onze conférences (plénières, publique et de lauréats) ainsi qu'une grande diversité de sessions, y compris une session de communications libres.

Toutes les activités scientifiques et sociales se dérouleront à l'hôtel Marriott, situé au 100, rue Kent, à Ottawa.

Le Comité des femmes en mathématiques de la SMC organise le 4e atelier du groupe **Connecting Women in Mathematics Across Canada (CWIMAC 2008)**. Les ateliers du groupe CWIMAC ont pour objectif de soutenir le perfectionnement professionnel des jeunes professeures d'université au sein de la communauté mathématique canadienne. L'édition 2008 se déroulera à l'Université d'Ottawa, les 4 et 5 décembre 2008.

Prix

Prix Coxeter-James : Ravi Vakil (Stanford)
Prix de doctorat : Matthew Greenberg (Calgary)
Prix Adrien-Pouliot : Harley Weston (Regina)
Prix G. de B. Robinson : à venir
Prix David-Borwein de mathématicien émérite pour l'ensemble d'une carrière : Hermann Brunner (Memorial)

Conférenciers pléniers

David Acheson (Oxford)
Fan Chung (UC San Diego)
Gilles Godefroy (Paris)
Sorin Popa (UCLA)
Laurent Saloff-Coste (Cornell)
Mark Sapir (Vanderbilt)
Keith Taylor (Dalhousie)

Conférence publique

Patrick Hayden (McGill)

Séances de travail

Réunion du Comité exécutif : le jeudi 4 décembre; Marriott, salle Sussex
Lunch du Groupe de développement : le vendredi 5 décembre; Marriott, salle Laurier
Réunion du Conseil d'administration : le vendredi 5 décembre; Marriott, salle Cartier III

Activités sociales

Réception d'accueil : le vendredi 5 décembre, Marriott

Banquet : le samedi 6 décembre, Marriott, salle de bal
Du café et des jus seront servis durant les pauses prévues à l'horaire.

Inscription

Vous pouvez vous procurer le formulaire d'inscription au www.smc.math.ca/Events/f

Les tarifs sont indiqués en dollars canadiens dans le tableau. Nous acceptons les paiements par chèque (dollars CAN ou US), VISA ou MasterCard. Le paiement doit nous parvenir au plus tard le 25 novembre pour que nous ayons le temps de traiter votre paiement avant le congrès. Les reçus seront remis sur place.

La date limite pour l'inscription lève tôt a été prolongée au 15 octobre.

	EN LIGNE		SUR PLACE
	Inscr. hâtives jusqu'au 30 sep	Tarif normal 1 oct – 25 nov	
Conférencier primé (2 billets pour le banquet)	0 \$	0 \$	0 \$
Conférencier (plénière ou publique) (1 billet pour le banquet)	0 \$	0 \$	0 \$
Étudiants	95 \$	125 \$	150 \$
Étudiants postdoctoraux, retraités, enseignants (mat., prim., sec.), sans emploi	150 \$	175 \$	200 \$
Membres, organisateurs et conférenciers de la SMC	295 \$	345 \$	395 \$
Non-membres	445 \$	495 \$	545 \$
Tarif quotidien (sur place seulement)	-	-	175 \$

Avantages de la préinscription :

- Votre nom figurera dans la liste des participants sur le site du congrès
- Votre trousse d'inscription sera déjà prête à votre arrivée le vendredi soir
- Vous n'aurez pas besoin de faire la file pour vous inscrire à la première heure samedi matin!
- Les billets pour le banquet sont en vente maintenant, mais il pourrait ne plus en rester sur place

Politique de remboursement

Les participants qui désirent annuler leur inscription doivent en aviser le bureau administratif de la SMC (reunion@smc.math.ca) par écrit au plus tard le 25 novembre pour se voir rembourser leurs frais d'inscription (moins 40 \$). Les participants dont les communications libres n'auront pas été acceptées seront remboursés intégralement sur demande.

Envoi de résumés

Pour pouvoir publier votre résumé en ligne et dans le programme de la Réunion, nous devons le recevoir au plus tard le 15 octobre 2008. Veuillez utiliser le formulaire électronique au smc.math.ca/forms/abs-w08. Les organisateurs remercient les conférenciers de bien vouloir respecter cette importante échéance.

Hébergement

L'hôtel ci-dessous offre des chambres à un tarif de groupe préférentiel pour la durée du congrès ainsi que pour les trois jours qui précèdent et qui suivent l'événement. Pour y avoir droit, vous devez réserver avant les dates limites indiquées en mentionnant le code de groupe. Les réservations faites après la date limite ne seront acceptées que s'il reste des chambres, et il

se pourrait que le tarif préférentiel ne soit plus en vigueur. Les tarifs sont par nuit, par chambre, et sont indiqués en devises canadiennes. Toute réservation doit être garantie par le paiement d'une nuit ou par une carte de crédit reconnue. Nous vous recommandons de vérifier les modalités de paiement et d'annulation au moment de faire votre réservation, car celles-ci varient d'un établissement à l'autre.

Hôtel Marriott Ottawa (www.ottawamarriott.com)
100, rue Kent, Ottawa (Ontario), K1P 5R7
Téléphone : 613-238-1122 ou 1-800- 853 8463, Fax : 613-783-4229

Les participants qui réserveront leur chambre au Marriott au plus tard le 31 octobre seront inscrits au tirage des prix suivants :

- Un brunch du dimanche pour deux au Merlot Rooftop Grill
- Un souper pour deux au restaurant Toulouse
- Une nuitée de fin de semaine à l'hôtel Marriott

Date limite : 4 novembre 2008
Code de groupe : CMSCMSA

Tarifs

Accès internet haute vitesse et appels locaux gratuits.
Chambre standard (deux lits doubles ou un très grand lit) – 139 \$
Tarif pour une ou deux personnes; 3 ou 4 personnes : 10 \$ par personne supplémentaire.
Taxes : 5 % de TPS (remboursement accordé aux visiteurs de l'étranger), 6 % de taxe de vente provinciale, droits de marketing de destination : 3 %.

Aucun animal n'est permis dans les chambres
Hôtel entièrement non fumeur
Gratuit pour les enfants de moins de 18 ans qui occupent la même chambre que leurs parents. Le personnel de la réception pourra vous aider à trouver un gardien ou une gardienne.

Stationnement : libre-service : 20 \$ par jour; 6 \$ l'heure; service voiturier : 25 \$ par jour

Arrivée : 15 h
Départ : 13 h

Pour les résidences étudiantes, contacter la Coordinatrice de la Réunion (reunions@smc.math.ca).

Déplacements

Le trajet en taxi de l'aéroport au centre-ville coûte autour de 25 \$.

Le trajet en navette coûte 8 \$ aller simple et 16 \$ aller-retour. Comme il s'agit d'un tarif spécial de groupe, veuillez préciser que vous êtes inscrit à la Réunion au moment d'acheter votre billet. Le tarif habituel est de 14 \$ pour un aller simple et de 24 \$ pour un aller-retour. Pour consulter l'horaire, passez au www.yowshuttle.com.

Vous trouverez des renseignements détaillés concernant l'Université Carleton, la ville d'Ottawa et la province de l'Ontario (renseignements touristiques, température et climat locaux, cartes de la ville et des attractions touristiques, circuits touristiques piétonniers, etc.) sur les sites web suivants :

- Université Carleton (www.carleton.ca)
- Tourisme Ottawa (www.ottawatourism.ca/index.php?lang=fr)

- Ontario Travel (www.ontariotravel.net)
- Service météorologique du Canada (www.meteo.gc.ca)

Déplacements pour étudiants diplômés

Les étudiants diplômés du Canada ou de l'étranger ont accès à un fonds limité pour financer une partie de leurs frais de déplacement et de séjour. La préférence est toutefois accordée aux étudiants canadiens. Toute demande de financement doit être accompagnée d'une lettre du superviseur de l'étudiant ou de la personne responsable des études supérieures de son département, dans laquelle il ou elle indiquera le nom de l'étudiant, son domaine et son niveau d'études, en quoi la Réunion sera profitable à l'étudiant, si l'étudiant présentera une communication et si l'étudiant a accès à d'autres sources de financement.

La lettre doit parvenir à la SMC avant le 15 octobre 2008 (gradtravel-w08@smc.math.ca). Les décisions seront annoncées à la fin d'octobre.

Si une subvention est accordée à l'étudiant, ce dernier se verra rembourser ses dépenses après la Réunion sur présentation du formulaire de remboursement approprié accompagné des reçus originaux.

Pour de plus amples renseignements, veuillez communiquer avec la responsable des Réunions (gradtravel-w08@cms.math.ca). Pour les résidences étudiantes, contacter la Coordinatrice de la Réunion (reunions@smc.math.ca).

Salon des exposants

Le salon des exposants sera ouvert de 9 h 30 à 16 h le samedi et le dimanche dans la salle Victoria South.

Exposition conjointe : On y présentera des produits de maisons d'édition et d'autres entreprises et organismes non représentés à la Réunion. On trouvera des bons de commande sur place, qui seront transmis aux entreprises concernées après la Réunion. Les livres et autres produits qui seront présentés à cette occasion seront offerts à l'université hôte.

Nous vous invitons à visiter le comptoir d'adhésion et l'exposition de livres de la SMC dans l'aire d'inscription. Un représentant sera sur place de 9 h 30 à 16 h pour fournir des renseignements sur l'adhésion, les publications et les autres activités de la Société.

Commanditaires

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.

- Centre de recherches mathématiques
- Institut Fields
- MITACS
- Institut du Pacifique pour les sciences mathématiques
- Université Carleton
- Le doyen de la Faculté des sciences
- La vice-rectrice à la recherche
- Le vice-recteur aux études

La SMC tient à remercier les directeurs de la Réunion et les organisateurs de sessions.

BLOCK SCHEDULE

THURSDAY/JEUDI December 4 décembre	SATURDAY/SAMEDI December 6 décembre	SUNDAY/DIMANCHE December 7 décembre	MONDAY/LUNDI December 8 décembre
18:00-22:00 Executive Committee Meeting Réunion du Comité exécutif	8:00 – 16:30 Registration/Inscription 9:30 – 16:30 Exhibits/Expositions	8:00 – 16:30 Registration/Inscription 9:30 – 16:30 Exhibits/Expositions	8:00 – 16:00 Registration/Inscription
	8:30 – 9:00 Opening/Ouverture	8:00 – 10:00 Scientific Sessions	8:00 – 10:00 Scientific Sessions
	9:00 – 9:45 Sorin Popa		
10:00 – 10:30 Break / Pause			
11:00 – 13:00 Development Group Luncheon Lunch du groupe de développement 13:30 – 18:30 Board of Directors Meeting Réunion du conseil d'administration	10:30 – 12:00 Scientific Sessions	10:30 – 11:15 Gilles Godefroy	10:30 – 11:15 David Acheson
	12:00 – 12:30 Harley Weston A. Pouliot Prize Lecture	11:30 – 12:15 Ravi Vakil Coxeter -James Lecture	11:30 – 12:15 Doctoral Prize Lecture (winner to be announced)
	12:30 – 14:00 Lunch Break		
	14:00-15:00 Scientific Sessions	14:00-15:00 Scientific Sessions	14:00-15:00 Scientific Sessions
	15:00 – 15:45 Fan Chung	15:00 – 15:45 Mark Sapir	15:00 – 15:45 Laurent Saloff-Coste
	16:00 – 16:15 Break/Pause		
	16:15 – 17:15 Scientific Sessions	16:15 – 17:45 Scientific Sessions	16:15 – 17:15 Scientific Sessions
19:00 – 20:00 Patrick Hayden Public Lecture	18:00 – 19:00 Reception (cash bar) Réception (bar payant)	18:00 – 19:00 Keith Taylor	
20:00-21:30 Welcome Reception Réception d'accueil	19:00 – 22:00 Banquet		

(as of September 5, 2008)

EMPLOYMENT OPPORTUNITY

FIELDS INSTITUTE, TORONTO, CANADA - POSTDOCTORAL FELLOWSHIPS

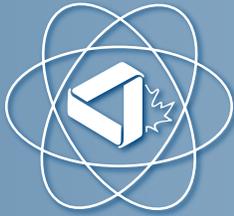
Description: Applications are invited for postdoctoral fellowship positions for the 2009-2010 academic year. The (Fall 2009) Thematic Program on Foundations of Computational Mathematics will take place at the Institute July to December 2009 and the (Winter/Spring 2010) Thematic Program on Quantitative Finance: Foundations and Applications will take place at the Institute from January to June 2010. The fellowships provide for a period of engagement in research and participation in the activities of the Institute. In addition to regular postdoctoral support, one visitor for each six-month program will be awarded the Institute's prestigious Jerrold E. Marsden Postdoctoral Fellowship. Applicants seeking postdoctoral fellowships funded by other agencies (such as NSERC or international fellowships) are encouraged to request the Fields Institute as their proposed location of tenure, and should apply to the Institute for a letter of invitation.

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

Deadline: **December 15, 2008** although late applications may be considered.

Application Information: Please consult
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.



NOUVEAU LIVRE ATOM!

Aime-T-On les Mathématiques (ATOM) Tome 8 – Problems of Mathematical Leagues III est maintenant disponible. Acheter votre copie aujourd'hui!

Auteurs: Peter I. Booth
John Grant McLaughlin
Bruce L.R. Shawyer

Vous pouvez également placer votre ordre au site Web www.smc.math.ca

PRODUIT REPRÉSENTÉ: NOUVEAU LIVRE ATOM			PRIX RÉGULIER	PRIX MEMBRE	QUANTITÉ	SOUS-TOTAL
NOUVEAU! ATOM Tome 8 – Problems for Mathematics Leagues III			12,00 \$	9,00 \$		
<i>Les livres d'ATOM suivants sont disponible pour achat:</i>						
Tome	Titre	Auteur	PRIX RÉGULIER	PRIX MEMBRE	QUANTITÉ	SOUS-TOTAL
1	Mathematical Olympiads' Correspondence Program	Edward J. Barbeau	12,00 \$	9,00 \$		
2	Algebra – Intermediate Methods	Bruce Shawyer	12,00 \$	9,00 \$		
3	Problems for Mathematics Leagues	Peter I. Booth John Grant McLoughlin Bruce L.R. Shawyer	12,00 \$	9,00 \$		
4	Inequalities	Edward J. Barbeau Bruce L.R. Shawyer	12,00 \$	9,00 \$		
5	Combinatorial Explorations	Richard Hoshino John Grant McLoughlin	12,00 \$	9,00 \$		
6	Problems for Mathematics Leagues II	Peter I. Booth John Grant McLoughlin Bruce L.R. Shawyer	12,00 \$	9,00 \$		
7	Problems of the week	Jim Totten	12,00 \$	9,00 \$		
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 Pour adresse à l'étranger, paiement requis en devises américains et inclure la banque émettrice.

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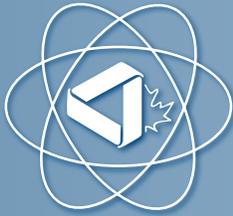
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À VENIR!

Vous trouverez bientôt des nouveaux produits promotionnels de la SMC dans une des prochaines NOTES.



NEW ATOM RELEASE!

A Taste Of Mathematics (ATOM) Volume 8 – Problems of Mathematical Leagues III is now available. Get your copy today!

Authors: Peter I. Booth
John Grant McLaughlin
Bruce L.R. Sawyer

You can also order via our website at www.cms.math.ca

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1	Mathematical Olympiads' Correspondence Program	Edward J. Barbeau	\$ 12.00	\$ 9.00		
2	Algebra – Intermediate Methods	Bruce Sawyer	\$ 12.00	\$ 9.00		
3	Problems for Mathematics Leagues	Peter I. Booth John Grant McLoughlin Bruce L.R. Sawyer	\$ 12.00	\$ 9.00		
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5	Combinatorial Explorations	Richard Hoshino John Grant McLoughlin	\$ 12.00	\$ 9.00		
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7	Problems of the week	Jim Totten	\$ 12.00	\$ 9.00		
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not uniformly great successes, but when they aren't, they trouble me and I struggle to understand why.

The second thing is the interactive nature of my courses. I teach in a conversational way, involving leading questions, time for students to think, and an atmosphere where no question or comment is unwelcome. I feel that I explain ideas well only in a discursive structure. Over the years, I've learned to teach through conversation and, at the same time, maintain a necessary pace through a heavy load of material.

Among university disciplines, mathematics lends itself particularly well to teaching in a discursive way, because mathematical arguments can always be broken down into mini-problems that teachers and students are able to work through together, by questions and responses in both directions.

I don't believe that teaching in an interactive way necessarily depends on very small classes, and don't know of any real evidence that students learn better in very small than in larger classes. I don't have experience teaching more than 200 students in a class, but feel most comfortable in classes of 75-100. This is a question of personal feeling, but from my experience, even 150-200 students is not itself an impediment to dialogue.

Thirdly, I try to listen to my students and to learn from them. Big classes are no help here, so it's necessary to devote lots of office time to personal contact. It's not easy for students to find their way in a big impersonal university like Toronto. They need contact with their teachers, but getting to know my students also gives me a lot of satisfaction, and understanding what my students find challenging helps me to prepare better classes.

All of these things concern human interaction. They also refer mostly to my experience as a *lecturer*. I don't claim that lecturing is the only way or the best way to teach, or the best means for students to learn, though I believe lectures can be effective. Technology is of course transforming university teaching and the way that students learn. But human interaction plays the most important part in all effective teaching-learning relationships, and this is the part that I'm reflecting on.

William Thurston has written that our goal as mathematicians is to "advance human understanding of mathematics" [*Bull. Amer. Math. Soc.* 30 (1994), 161-177]. We come to meetings and present papers at conferences for human mathematical contact. We get satisfaction from other mathematicians' using our work, and from the impact of our work on students and colleagues. As academics, we spend a lot of time judging each other - perhaps too much time - but most of us need the *positive* judgment of others.

This is to say that communication of mathematical understanding is the job of mathematicians. The teaching-learning relationship is a central part of that communication.

Goal of teaching. The goal of our teaching is for our students to learn mathematics.

Mathematics is a difficult, hierarchical subject and of course we want to communicate to our students a certain body of material. But our best students are sometimes capable of leaps of intuition that seem to make our teaching superfluous. I've been dismayed by some of my top students' seldom coming to classes. (I can think of one who recently became a professor at the Institute for Advanced Study, who at least comforted me with the assurance that he came to more of my lectures than in his other courses!) Probably the main goal of teaching is to empower our students to struggle and grope on their own; in other words, to reduce their need for us.

Helping our students become engaged in the learning process depends on both practical but important things, like *pacing*, and more spiritual things, like *inspiration*.

In his book on *How to Teach Mathematics* [2nd edition, Amer. Math. Soc., 1999], Steven Krantz attributes to Gary Jensen and Meyer Jerison the idea that pacing is one of the main ingredients of learning. He compares the process of learning mathematics to learning to play the piano. Without a teacher, one may have neither the patience nor the discipline to learn hand positions, scales, chords and simple pieces before working up to the sonatas of Beethoven. A student needs a well-conceived program to succeed.

I've taught first-year calculus during much of my teaching career, and still believe that it can be as inspiring as a class on Shakespeare or T.S. Elliott taught by a master of literature. Calculus is one of the greatest achievements of human intellectual history; I think even the routine problems of an elementary course can be made alive by this perspective.

One of the remarkable things about mathematics is that a great advance often has a very simple kernel that is not so far removed from the ideas of elementary courses. We're never so rushed that there isn't time for such insights. As one simple example from calculus, a student can better appreciate the tan half-angle formulas not just as a trick for integration, but as a solution to an interesting problem on rational parametrization of curves.

Some years ago when I was working with my collaborator Pierre Milman on a problem concerning composite differentiable functions, I wondered about the simplest example as a possible topic for first-year calculus - Can an infinitely differentiable even function be written as a C^∞ function of x^2 ? Surprisingly enough, this is a nontrivial result due to Hassler Whitney [*Duke Math. J.* 10 (1943), 159-160]. The way we were looking at the general composite function problem gave a beautiful simple argument for this special case that combined calculus and linear algebra and was easily accessible to my students.

My most satisfying experiences as a teacher are when the activities of my students show they have been inspired. As a recent example, one of my third-year undergraduates who was taking my graduate course on complex analysis last year wrote up complete notes on the course, on his own initiative,

and made them available online for future students. I am very grateful for this kind of appreciation.

Teaching to achieve learning goals. I'll say a few words about what I find important for the purpose of teaching to try to achieve these learning goals. I would distinguish four things: Care and respect for my students, patience, preparation, and structure.

Care and respect are as essential to success in our courses as they are in any of our human relationships. Philip Loewen described it very beautifully when he was awarded the Excellence in Teaching Award in 2005. He said that the teaching-learning experience is a game with three players - the teacher, the students and the material. It shouldn't be a game where the students are pitted against the teacher and the material, but rather a game in which the teacher and students play together in a common struggle with the material.

Care and patience go together. Thurston describes mathematics as having a remarkable compressive property - when we master an idea, it becomes so natural that we forget the struggle and frustration that went into learning it. This creates a psychological barrier that makes it hard for us to learn from our students. Taking the time to understand what a student finds difficult or challenging benefits everyone by allowing a teacher to adjust and improve the presentation of a course as it unfolds.

Patience also goes hand-in-hand with preparation. As Krantz says, our students usually aren't interested in seeing how a mathematician really thinks in struggling to come up with an argument! When we get confused in class, it makes us frustrated and snappy. At the same time of course, it's good

to be spontaneous, and it's also important to be intellectually modest. Students ask questions that I can't always answer on the spot. I've learned there's nothing wrong with saying that I have to think about something, provided that I do think about it.

Concerning *structure*, one of the things that bothered me when I was an undergraduate was that mathematics courses seemed to be given according to a *tube-of-toothpaste model* - a little more paste was squeezed out in every class until hopefully the tube was emptied with enough time left for review before the final exam. I think that not only should courses have structure, but also I try to make each of my classes a unit that stands on its own, with an introduction, climax and conclusion.

Concluding remark. I'd like to make one additional remark in concluding here. I've been talking about human interaction in the teacher/student relationship. But the teaching/learning relationship in big universities usually involves interaction within a larger team. A great part of the success of my courses has been due to the dedication, care and inspired teaching of the students, both graduate and undergraduate, who have served as my teaching assistants. So in accepting the CMS Teaching Award, I want to express my gratitude also to them.

I'd also like to acknowledge one special person at Toronto, our Undergraduate Administrator Marie Bachtis, who is retiring this year. Marie has done more than anyone else in our Department to create an atmosphere where our students feel cared for and appreciated, and also learn to act as responsible adults whose future is in their own hands. Marie's help, good humour and friendship over the 25 years I've had the pleasure of working with her have been a true inspiration.

OBITUARY Irving Kaplansky (1917-2006)

Irving Kaplansky was born on 17 March 1917 in Toronto. His parents were emigrés from Poland. Known as 'Kap' among his many friends and colleagues, he was not only a brilliant mathematician and teacher but also an accomplished musician and pianist. He has performed with the famous comedy pair Wayne and Shuster who were his college mates.

He graduated with a Bachelor's degree in 1938 from the University of Toronto, where he was a member of the team (along with John Coleman and Nathan Mendelsohn) which won the first William Lowell Putnam competition. After completing a master's degree at Toronto he went to Harvard University and earned his Ph.D in 1941 under the direction of Saunders MacLane; the title of his thesis was *Maximal fields with valuations*. He continued at Harvard as Benjamin Peirce Instructor until 1944. During 1944-45 he worked with the Applied Mathematics Group of the National Defence Council at Columbia University. He moved to the University of Chicago in 1945 and remained there till his retirement in 1984. He was chairman of the mathematics department during 1962-67; in 1969 he held the position of Herbert Mead Distinguished Service Professor. After retirement he was the director of MSRI, University of California, Berkeley.

Kaplansky's mathematical accomplishments range from active participation in the Problems & Solutions sections of the American Mathematical Monthly to major research contributions to several different areas: topological algebra, operator algebras, group theory, ring theory, Lie groups and algebras, homological algebra, quadratic forms, number theory, combinatorics, linear algebra, probability, and game theory. His books on many of these subjects have been a source of inspiration due their clarity and elegant style. Not surprisingly he has been the recipient of many awards, prizes and honours. Fifty-five doctoral students obtained their Ph. D. under his direction. His lectures were popular and well attended; he possessed a remarkable talent for effective instruction.

Right up to the last few months of his life he worked on mathematical problems while living at his son Steven's house in Los Angeles. He died of respiratory failure on June 25, 2006. He is survived by his wife Chellie, and three children, Lucie, Steven and Alex.

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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 two tenure-track positions, one of which is at the Assistant Professor level, and the other at the Assistant or Associate Professor level, starting July 1, 2009. For the Assistant Professor level, we are seeking candidates with at least one year of postdoctoral experience. For the Associate Professor level, 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. Candidates from all areas of mathematics or statistics are encouraged to apply; however, for one of the positions, priority will be given to candidates in Algebra.

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 7, 2008** or until the positions are filled.

Conditions of employment are set by a collective agreement. Employment equity is University policy and the University strongly encourages applications from women. Canadian citizens and permanent residents will be considered first.

Information about the department can be found at <http://www.mathstat.uottawa.ca>

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Son emplacement stratégique au cœur 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 deux postes menant à la permanence, l'un au rang de professeur adjoint et l'autre au rang de professeur adjoint ou de professeur agrégé. Entrée en fonction: le 1er juillet 2009. Pour le rang de professeur adjoint, nous recherchons des candidats avec au moins une année d'expérience postdoctorale. Pour le rang de professeur agrégé, la personne choisie devra avoir fait ses preuves tant comme chercheur que comme enseignant, et ce à tous les niveaux. En particulier elle devra être en mesure de diriger des étudiants de deuxième et troisième cycle dès son entrée en fonction. Nous encourageons les candidat(e)s dans tous les domaines des mathématiques et de statistique à postuler, cependant pour un des postes, nous donnerons priorité aux candidat(e)s dont le domaine de recherche est en algèbre.

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. Les dossiers doivent comprendre un curriculum vitae, un plan de recherche ainsi que quatre lettres de recommandation confidentielles dont une portant 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. La date limite de réception de candidatures est le **7 novembre 2008**. Nous accepterons toutefois les applications tardives tant que les postes n'auront pas été comblés.

Les conditions d'emploi sont déterminées par une convention collective. L'université a une politique d'équité en matière d'emploi. Les femmes sont fortement encouragées à poser leur candidature. On étudiera d'abord les demandes des citoyens canadiens et des résidents permanents.

Pour plus de renseignements voir <http://www.mathstat.uottawa.ca>

RÉFLEXIONS SUR L'ENSEIGNEMENT DES MATHÉMATIQUES AU PREMIER CYCLE..

Note de la rédaction : Au lieu de l'article habituel de la page titre, nous vous proposons l'allocution prononcée par Ed Bierstone lorsqu'il a reçu le Prix d'excellence en enseignement de la SMC à la Réunion d'été 2008 tenu à Montréal.

C'est un grand honneur pour moi de recevoir le Prix d'excellence en enseignement de la SMC. J'aimerais remercier sincèrement la Société mathématique du Canada et Nelson Education Ltd. qui, par ce prix, manifestent leur appui à l'enseignement des mathématiques au premier cycle.

Permettez-moi d'abord de me dégager de toute responsabilité : la façon la plus facile d'être considéré comme un bon enseignant, c'est d'avoir de bons étudiants! Durant mes trente-cinq années d'enseignement à l'Université de Toronto, j'ai eu le grand bonheur de croiser un nombre incalculable d'étudiants exceptionnels. Des passionnés de mathématiques qui prennent soin les uns des autres et qui se préoccupent du monde qui les entoure. Je sais que les témoignages de mes anciens étudiants y sont pour beaucoup dans ma mise en candidature pour ce prix de la SMC. Je suis donc honoré et très touché de voir que j'aurai quelque peu contribué à la motivation de mes étudiants.

C'est la première fois que je prononce une conférence sur l'enseignement. Je n'ai jamais fait de recherche en éducation, je me suis toujours contenté de donner mes cours, de faire de mon mieux pour nourrir l'intérêt de mes étudiants et de transmettre ma passion pour les mathématiques. Je suis plus à l'aise de parler de mathématiques que d'enseignement en fait! Le Prix d'excellence en enseignement de la SMC est particulier en ce sens qu'il porte sur la qualité de l'enseignement comme tel, sur l'efficacité de l'enseignement au premier cycle et sur notre influence sur les étudiants et sur nos collègues. Comme la plupart d'entre vous, je consacre une bonne partie de mon temps et de mon énergie à enseigner au premier cycle, mais je réfléchis rarement à ma conception de l'enseignement ou à mes pratiques pédagogiques. Cette conférence m'a donc amené (ou forcé plutôt) à m'arrêter aux raisons qui m'ont dirigé vers l'enseignement et à ma façon d'enseigner. J'aimerais ainsi partager avec vous quelques-unes de mes expériences et de mes réflexions sur l'enseignement au premier cycle universitaire.

Si je me dégage de toute responsabilité, c'est en raison du rapport entre l'enseignement et l'apprentissage. Il arrive que nos meilleurs étudiants n'aient pas besoin d'enseignants. Les expériences d'apprentissage de nos étudiants ne sont pas toujours des critères d'évaluation de la qualité de l'enseignement. Et si l'on tente d'évaluer dans quelle mesure nos étudiants ont appris dans nos cours ou s'ils y ont été inspirés, nous ne pensons souvent qu'aux étudiants qui nous ressemblent, qui sont à l'aise avec les concepts mathématiques ou intéressés par une profession à dominante mathématique. Nos groupes les plus grands comptent de très nombreux étudiants bourrés de potentiel dont les mathématiques ne sont pas l'intérêt principal. Nous ne savons pas vraiment si nous les amenons à s'engager dans leur apprentissage, si notre enseignement est une source d'inspiration ou si nous élargissons leurs horizons professionnels.

Je ne vous parlerai pas ce soir de réforme pédagogique, mais plutôt de ce que je considère comme le but de l'enseignement des mathématiques au premier cycle, et de ma façon de le faire au meilleur de ma connaissance.

Relations humaines. Trois éléments concourent à mon efficacité comme enseignant de premier cycle.

Premièrement, et très simplement : j'adore enseigner, et mes étudiants me tiennent à cœur. Je suis encore fébrile quand je

rencontre un groupe pour la première fois, et même un peu nerveux. La qualité de mes cours dépend beaucoup du contact qui s'établit entre mes étudiants et moi. Je suis généralement à l'écoute de leurs émotions. Leurs réussites m'exaltent, et leurs échecs me chagrinent. Mes cours de premier cycle ne sont pas tous de grandes œuvres, mais quand ils ne le sont pas, ça me chicote et je cherche à comprendre pourquoi.

Deuxièmement, mes cours sont interactifs. J'ai une méthode d'enseignement conventionnelle : je pose des questions, j'accorde du temps de réflexion aux étudiants et je les rassure que toutes les questions et tous les commentaires sont les bienvenus. En fait, j'explique beaucoup mieux les concepts en discutant avec mes élèves. Au fil des ans, j'ai apprivoisé l'enseignement discursif tout en maintenant un rythme qui me permet de couvrir toute la matière d'un programme chargé.

Les mathématiques sont une des disciplines universitaires qui se prêtent particulièrement bien à l'enseignement discursif. En effet, les problèmes mathématiques sont toujours divisibles en mini-problèmes que les enseignants et les étudiants peuvent résoudre ensemble en posant des questions et en y répondant.

Je ne crois pas que l'enseignement interactif soit possible dans les très petits groupes seulement, et je n'ai jamais vu de preuve tangible que les élèves apprennent mieux dans de très petits groupes que dans de grands groupes. Je n'ai jamais enseigné à plus de 200 étudiants à la fois, mais je suis très à l'aise devant un groupe de 75 à 100 personnes. C'est une question personnelle, mais d'après mon expérience, le dialogue est possible même dans un groupe de 150 à 200 étudiants.

Et troisièmement, j'essaie d'écouter mes étudiants et d'apprendre à leur contact. Les grands groupes n'étant pas l'idéal pour cela, j'ouvre la porte de mon bureau à mes étudiants et je leur consacre ainsi un grand nombre d'heures individuellement. Ce n'est pas facile pour eux de se frayer un chemin dans une grande université impersonnelle comme l'Université de Toronto. Ils ont besoin d'établir des liens avec leurs enseignants, et moi je trouve une grande satisfaction à leur contact et je peux améliorer constamment mes cours parce que je suis au courant des obstacles qu'ils rencontrent.

Tous ces éléments concernent les relations humaines. Ils relèvent pour la plupart de ma propre expérience comme enseignant. Je ne dis pas que l'enseignement théorique est la seule ou la meilleure façon d'enseigner, ni la meilleure façon d'apprendre, mais je crois en son efficacité. Bien sûr, la technologie transforme l'enseignement universitaire et la façon dont les étudiants apprennent. Les relations humaines sont toutefois l'élément le plus important de tout rapport enseignant-étudiant, et c'est de ce rapport dont je vous parle aujourd'hui.

William Thurston a écrit que notre objectif comme mathématiciens consistait à « faire avancer la compréhension humaine des mathématiques » [Bull. Amer. Math. Soc. 30 (1994), 161-177]. Nous assistons à des congrès et présentons des communications pour rapprocher les humains des mathématiques. Nous tirons satisfaction du fait que d'autres mathématiciens utilisent nos travaux, et de l'influence de nos travaux sur le travail de nos étudiants et de nos collègues. En tant qu'universitaires, nous passons beaucoup de temps à nous juger les uns les autres. Trop peut-être. Ce dont nous avons le plus besoin, ce sont des commentaires positifs de notre entourage.

Tout cela pour dire que l'objectif d'un mathématicien consiste à faire comprendre les mathématiques, et que le rapport enseignant-étudiants est au cœur de cette communication.

Pourquoi enseigner? Nous enseignons pour que nos étudiants apprennent les mathématiques.

Les mathématiques sont une matière difficile et hiérarchique. Bien sûr, nous voulons tous en transmettre à nos étudiants un certain volume. Il arrive toutefois que nos meilleurs étudiants fassent preuve d'une intuition telle que notre enseignement semble superflu. Je suis parfois désespéré de voir que mes meilleurs étudiants n'assistent pas à mes cours. (L'un d'entre eux, qui vient d'obtenir un poste de professeur à l'Institut des études supérieures, m'a rassuré un peu en me disant que son assiduité à mes cours était supérieure à celle de tous ses autres cours!) Le but principal de l'enseignement est probablement de donner à nos étudiants les moyens de se débrouiller par eux-mêmes. Autrement dit, de réduire leur dépendance à notre égard.

Pour aider nos étudiants à jouer un rôle actif dans leur apprentissage, des éléments pratiques, mais importants, entrent en jeu, notamment le rythme, et des éléments d'ordre plus spirituel, comme l'inspiration.

Dans son livre intitulé *How to Teach Mathematics* [2e édition, Amer. Math. Soc., 1999], Steven Krantz attribue à Gary Jensen et à Meyer Jerison le concept du rythme comme ingrédient principal de l'apprentissage. Il compare l'apprentissage des mathématiques à l'étude du piano. Sans professeur, on peut manquer de patience ou de discipline pour apprendre la position des mains, les gammes, les accords et des pièces simples avant d'arriver aux sonates de Beethoven. Il faut suivre un programme bien conçu pour réussir.

J'ai enseigné le cours de calcul de première année presque toute ma carrière, et je continue de croire que c'est un cours aussi stimulant qu'un cours sur Shakespeare ou T.S. Elliott donné par un maître de la littérature. Le calcul différentiel et intégral est l'une des grandes réalisations de l'histoire intellectuelle de l'humanité. Dans cette perspective, je crois qu'il est possible de rendre intéressants même les problèmes les plus élémentaires d'un cours d'introduction.

Ce qui est particulièrement remarquable des mathématiques, c'est que les grandes percées partent souvent d'un élément très simple pas si éloigné des notions de base. Malgré les contraintes temporelles, il y a toujours place à de telles réflexions. Je pense à un exemple simple des cours de calcul : les étudiants comprennent mieux les formules de la tangente de l'angle moitié s'ils n'y voient pas seulement une méthode d'intégration, mais aussi une solution à un problème sur la paramétrisation rationnelle des courbes.

Il y a quelques années, à l'époque où je travaillais avec mon collaborateur Pierre Milman à un problème sur les fonctions composées différentiables, j'ai cherché l'exemple le plus simple que je pourrais inclure à un cours de calcul différentiel de première année : est-il possible d'exprimer une fonction paire infiniment différentiable comme une fonction de classe C^8 de x^2 ? Chose étonnante, il s'agit d'un résultat non trivial attribué à Hassler Whitney [Duke Math. J. 10 (1943), 159-160]. Notre façon d'aborder le problème général de la fonction composée a produit un argument simple et élégant pour ce cas particulier, faisant appel à la fois au calcul et à l'algèbre linéaire, qui était très accessible pour mes étudiants.

Ce que je trouve le plus gratifiant comme enseignant, c'est de voir, par leurs activités, que mes étudiants sont motivés. L'an dernier, par exemple, un de mes étudiants de troisième année inscrit à mon cours de deuxième cycle sur l'analyse complexe a rédigé des notes de cours détaillées, de sa propre initiative, et les a publiées sur Internet pour les autres étudiants. Je suis très reconnaissant à mes élèves pour ce genre d'initiative.

Enseigner pour que les étudiants atteignent leurs objectifs d'apprentissage. Je dirai maintenant quelques mots sur quatre éléments que je considère comme importants pour favoriser l'atteinte des objectifs d'apprentissage des étudiants : le souci et le respect des étudiants, la patience, la préparation et la structure.

Le souci et le respect sont aussi essentiels à la réussite de nos cours qu'ils le sont à toute relation humaine. Comme l'a si bien décrit Philip Loewen dans son allocution du Prix d'excellence en enseignement en 2005, le rapport enseignement-apprentissage met en scène trois acteurs : l'enseignant, l'étudiant et la matière. Il ne devrait pas y avoir les étudiants d'une part, et l'enseignant et à la matière de l'autre. L'enseignant et les étudiants devraient plutôt s'unir pour affronter la matière.

Le souci et la patience vont de pair. Pour Thurston, les mathématiques sont remarquablement compressibles – une fois un concept maîtrisé, il devient si naturel que nous oublions la difficulté et la frustration associées à son apprentissage. C'est ce qui crée la barrière psychologique qui nous empêche souvent d'apprendre de nos étudiants. Prendre le temps de comprendre les difficultés que rencontrent les étudiants est bon pour tout le monde, car l'enseignant peut alors s'ajuster et améliorer son cours au fur et à mesure.

La patience va aussi avec la préparation. Comme le dit Krantz, nos étudiants n'ont généralement pas envie de connaître le fin fond de la pensée d'un mathématicien lorsqu'ils essaient de justifier un argument. Un professeur qui s'embrouille en classe devient frustré et irritable. La spontanéité et la modestie intellectuelle sont aussi importantes par contre. Les étudiants posent des questions auxquelles je n'ai pas toujours réponse immédiatement. J'ai appris qu'il n'y avait rien de mal à dire qu'il fallait que j'y pense avant de répondre, pourvu que j'y pense pour vrai.

À propos de la structure, l'une des choses qui me dérangeaient le plus durant mes études de premier cycle, c'était le fait que les cours de mathématiques semblaient donnés selon le modèle du « tube de dentifrice » : on faisait sortir un peu de dentifrice chaque jour jusqu'à ce que le tube soit vide, en espérant qu'il reste assez de temps pour l'examen final... Je m'assure non seulement que mes cours sont structurés, mais aussi que chacun soit une entité autonome, avec une introduction, un développement et une conclusion.

Pour terminer, j'aimerais faire un autre commentaire. Je vous parle depuis le début des rapports humains dans la relation enseignant-étudiants. Dans les grandes universités, toutefois, cette relation met plutôt en scène toute une équipe. Je dois le succès de mes cours en grande partie au dévouement, à l'attention et à la motivation des étudiants de tous cycles qui m'ont appuyé comme assistants à l'enseignement. En tant que lauréat du Prix d'enseignement de la SMC, je souhaite leur exprimer toute ma gratitude.

J'aimerais aussi remercier une personne exceptionnelle à l'Université de Toronto : notre administratrice des programmes de premier cycle, Marie Bachtis, qui prend sa retraite cette année. Personne n'a fait autant que Marie pour que notre département soit un milieu où les étudiants se sentent en sécurité et appréciés, où ils apprennent à devenir des adultes responsables prêts à prendre leur avenir en main. Le soutien, la bonne humeur et l'amitié de Marie, au cours des 25 années pendant lesquelles j'ai eu le bonheur de travailler à ses côtés, ont été pour moi une grande source d'inspiration.

The properties of Toeplitz operators are more complicated than those of multiplication operators, and many beautiful theorems about them are exhibited in the third chapter. A particularly nice example concerns the case where the inducing function ϕ is continuous on the unit circle. It turns out that the spectrum of T_ϕ is the union of the range of ϕ and the set of points in the plane with nonzero winding number relative to ϕ .

Just as a Toeplitz operator may be viewed as the lower right hand corner of a doubly infinite Toeplitz matrix, a Hankel operator may be thought of as the upper right hand corner. An equivalent view makes it an operator on H^2 whose matrix is a Hankel matrix, i.e. constant on each diagonal perpendicular to the main diagonal. Work on these matrices goes back to Kronecker, who characterized the finite rank Hankel matrices. A theorem of Nehari states that a Hankel matrix represents a bounded operator precisely when the matrix entries are the negatively indexed Fourier coefficients of a bounded function ϕ . Thus the relation between the function theory and matrix theory is more complicated for Hankel operators than Toeplitz operators. But there are a number of fascinating properties of these operators

laid out in chapter four, including Nehari's Theorem and the characterization of compact Hankel operators.

A composition operator, as its name implies, composes an H^2 function f with a fixed analytic function ϕ , from the unit disc into itself: $C_\phi f = f \circ \phi$. No matter what the function ϕ the operator C_ϕ is bounded, and properties of the mapping ϕ relate to corresponding properties of the operator in interesting ways. For example the invertible composition operators correspond to the injective analytic mappings of the disc onto itself, and eigenvalues of C_ϕ result from fixed points of ϕ in the open unit disc.

The theories of Toeplitz, Hankel and composition operators have been the focus of a substantial number of studies and have each been dealt with in books and monographs. The book by Martínez-Avendaño and Rosenthal is a gentle way of getting started with these beautiful subjects and can be recommended as a text for a followup course to introductory courses in measure theory, function theory and functional analysis. In view of the lucid exposition it is also very well suited as a text for a

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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 Ph.D. degree in Mathematics or cognate discipline, an excellent research record in Mathematical Biology, strong communication and teaching skills, and leadership potential. Postdoctoral experience is normally expected.

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 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.

Applicants should submit their curriculum vitae, a research statement, a teaching profile outlining experience and/or interests, and at least three confidential letters of reference to:

Arturo Pianzola, Chair
Department of Mathematical and Statistical Sciences
University of Alberta
Edmonton, Alberta, Canada T6G 2G1

Electronic submissions should be directed to chairsec@math.ualberta.ca. The closing date for applications is November 7, 2008, or until a suitable candidate is found. Early applications are encouraged.

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.

OBITUARY Israel Halperin (1911-2007)

Israel Halperin was born in Toronto on Jan 5, 1911. His parents were Russian immigrants. His father, Solomon Halperin, was born in a small village in Ukraine and his mother came from a village in Romania. They were married in Montreal and settled in Scarborough, where they raised four children, Ben, Israel, Clara and Bill.

After Malvern Collegiate, Israel studied in Victoria College at the University of Toronto in 1928, graduating with a bachelor's degree in 1932. He won many awards and obtained top marks in mathematics and physics. Upon getting his master's degree, he went to Princeton University where he was the only Ph. D. student of John von Neumann. He spent three years at Yale and Harvard working closely with von Neumann on the new field of operator algebras in Hilbert space. Halperin returned to Canada in 1939 as an assistant professor at Queen's University in Kingston. He had already published several papers. He married Mary Esther Sawdy in December 1939. The Halperins had four children: Stephen, Constance, William and Mary Elizabeth. In 1942 he enlisted in the Royal Canadian Artillery and was commissioned as a second lieutenant. He worked mostly at the Canadian Army Research and Development establishment in Ottawa on artillery problems, explosives, and secret intelligence research. He attained the rank of Major before his discharge at the end of the war.

After the war, Halperin resumed his teaching career at Queen's. In February 1946 he was accused of passing atomic secrets to the U.S.S.R. The story of his arrest and eventual acquittal is given in full in www.alumnireview.queensu.ca (issue 1, 2008).

In collaboration with F. V. Atkinson he organized the Ontario Mathematical Meetings from 1966 to 1992. Halperin was one of the speakers at the official opening of the Fields Institute on June 11, 1992.

Halperin pioneered research on operator algebras and their applications by publishing a definitive result on the adjoints of differential operators in the *Annals of Mathematics*. He published 78 mathematical papers and completed two substantial manuscripts that von Neumann left in an inchoate state: *Continuous Geometry* (1960) and *Continuous Geometries with a Transition Probability* (1981). His presence at Toronto attracted many students, notably Bures, Wood, Ching, Elliott and Peter Rosenthal, who worked on classification problems in operator algebras. He continued as an active scholar well into his 80s; it was reported that he was having "serious mathematical thoughts" even in the last year of his life. He died of organ failure on March 8, 2007.

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CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

OCTOBER 2008 OCTOBRE

4 Einstein Lecture given by Freeman Dyson, (University of British Columbia, Vancouver, BC)
www.ams.org/amsmtgs/

4-5 AMS Western Section Meeting (UBC & PIMS, Vancouver, BC)
www.ams.math.org/amsmtgs/sectional.html

4-5 Number theory and related topics: Conference in honour of Prof. Paulo Ribenboim on the occasion of his 80th birthday (Laval University, Quebec City)
jmdk@mat.ulaval.ca; cl@mat.ulaval.ca

6-10 PDE and Differential Galois Theory (Drexel University, Philadelphia, PA)
gln22@drexel.edu

8-10 Global Analysis on Manifolds, (University of Rome, Rome, Italy)
leon@dmmm.uniroma1.it

22-24 22nd Midwest Conference on Combinatorics, Cryptography and Computing (University of Nevada, Las Vegas, Nevada)
www.mccc.info

NOVEMBER 2008 NOVEMBRE

2-7 Women in Numbers (Banff Centre, AB)
www.birs.ca

7-9 Applications of Geometry to Topology and Physics (Rutgers-Newark, N.J.)
www.math.uga.edu/gluckfest

26-31 Interactions Between Noncommutative Algebra and Algebraic Geometry (Banff Research Station, Banff, AB)
www.birs.ca/2008/summer_schools.html

DECEMBER 2008 DECEMBRE

4-5 CWiMAC 2008 - Connecting Women in Mathematics Across Canada (University of Ottawa, ON)
www.cms.math.ca

5-8 International Conference on Partial Differential Equations and Applications in honour of Professor Philippe G. Ciarlet's 70th birthday (City University of Hong Kong, Kowloon, Hong Kong)
www6.cityu.edu.hk/rcms/ICPDEA2008/

6-8 CMS Winter 2008 Meeting
www.cms.math.ca/Events

17-21 First Joint International Meeting of AMS with the Shanghai Mathematical Society (Shanghai, China)
www.ams.math.org/amsmtgs/internmtgs.html

JANUARY 2009 JANVIER

5-8 Joint Mathematics Meetings (Washington, D.C.)
www.ams.org/amsmtgs/national.html

12-16 Quantitative and Computational Aspects of Metric Geometry (IPAM, UCLA, CA)
www.ipam.ucla.edu/programs/mg2009

22-24 Connections for women: Algebraic Geometry and related fields (MSRI, Berkeley, CA)
http://www.msri.org/calendar/workshops/workshopInfo/471/show_workshop

FEBRUARY 2009 FEVRIER

23-27 Modern Moduli Theory (MSRI, Berkeley, CA)
www.msri.org/calendar/workshops/workshopInfo/472/show_workshop

APRIL 2009 AVRIL

30-May 3 Canadian Mathematics Education Forum 2009 (Vancouver, BC)
www.cms.math.ca

MAY 2009 MAI

10-15 ICMI (International Commission on Math Instruction) Study Conference on 'Proof and Proving in Mathematics Education' (Taipei, Taiwan)
www.icmi19.com

JUNE 2009 JUIN

6-8 CMS/CSHPM Summer Meeting 2009 (St. John's, NL)
www.cms.math.ca

15-18 3rd International Conference On Maths and Stats (Athens, Greece)
www.atiner.gr/

8-13 Workshop on Disordered Systems: Spin Glasses (CRM, Montreal, QC)
www.crm.math.ca/Mathphys2008

EMPLOYMENT OPPORTUNITY



香港城市大學
City University
of Hong Kong

City University of Hong Kong is one of eight tertiary institutions funded by the Government of the Hong Kong Special Administrative Region through the University Grants Committee of Hong Kong. A young and dynamic institution, the University aspires to be internationally recognized as a leading university in the Asia-Pacific region through excellence in professional education and applied research. It has a growing international reputation, as evidenced by its surge up the rankings of the world's top 200 universities according to the Times Higher Education Supplement. The mission of the University is to nurture and develop the talents of students and to create applicable knowledge in order to support social and economic advancement. Currently, approximately 26,000 students are enrolled in over 180 programmes ranging from associate degrees to PhD. The medium of instruction is English.

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Application and Information

Further information about the posts and the University is available at <http://www.cityu.edu.hk>, or from the Human Resources Office, City University of Hong Kong, Tat Chee Avenue, Kowloon, Hong Kong [Fax : (852) 2788 1154 or (852) 2788 9334/email: hroj@cityu.edu.hk.] Please send an application letter enclosing a current curriculum vitae to the Human Resources Office by **16 January 2009**. Please quote the reference of the post applied for in the application and on the envelope.

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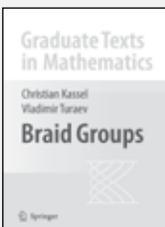
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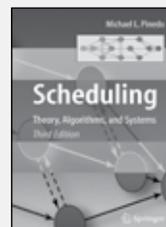
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