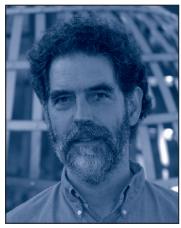




CMS NOTES de la SMC

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THE MATHEMATICS - NSERC LIAISON COMMITTEE *Walter Craig, McMaster University*

The present incarnation of the Mathematics - NSERC Liaison Committee was formed in 2007 on the eve of the NSERC international review, with the purpose of representing the Canadian mathematics community in the selection of members of the international review committee. There was probably a kernel of founding members, including Rachel Kuske, Andrew Granville, Jacques Hurtubise, and maybe several others, but I myself became involved at the 2008 CMS Summer Meeting in Montreal. We got together, formed a constitution, named our first chair (Jacques Hurtubise) and set down to the business of generating a list of mathematician nominees to the NSERC International Review Committee, and communicating this list to NSERC. At the time we noted that other disciplines seemed to have standing committees whose purpose was to communicate with NSERC, while in the past the mathematics community seemed only to form one when urgent NSERC business loomed. We thus decided that it would be a good idea to be a standing committee ourselves. We made a point of being independent of the mathematics professional societies, while for the purpose of community representation specifically including members of them, the CMS and CAIMS in particular, as well as our institute directors. It seems that we were reasonably successful with our first endeavor, and the NSERC International Review Committee wrote a very nice report which stated that at that point in time NSERC on the whole was doing a number of things right.

Information about the current activities of our committee appears on the website of the Mathematics - NSERC Liaison Committee (MNLC for short), which you can find here:

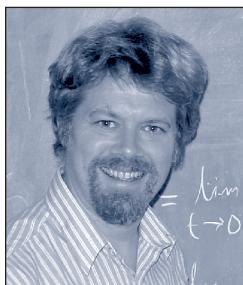
https://nmlc.math.ca/blogs/NSERC_Liaison_Committee/blog/2011/04/26/canadian-mathematics-community-statement-about-nserc-discovery-grants/

There you will also find a list of the committee's present members. If you were to do a Google search, the results would probably include several other liaison committees, with the NSERC - Math & Stats Liaison Committee (NSERC-M&S LC) and the Statistical Society of Canada - Research Committee among them. The idea of this article is to describe the purpose and the activities of our committee (the MNLC). In the course of this, I will also try to explain why there seems to be such a plethora of similarly named committees.

As stated in the MNLC's constitution, its mandate is to 'represent to NSERC the concerns and desires of the Canadian Mathematics Community on NSERC's programs and policies, and to report back through its various representatives to its constituent members'. General actions that we have undertaken include the above mentioned nominations to the NSERC International Review Committee, and as well, we have been regularly asked by NSERC staff for suggestions for their appointments to the Mathematics & Statistics Evaluation Group (EG 1508) which ranks our Discovery Grant proposals, and for the analog committee for NSERC graduate fellowships. After the international review we met occasionally, at least once per year, and Jacques would communicate our conversations to NSERC, and his conversations with NSERC back to us (sometimes these conversations were pointed and critical, as NSERC reaction to the report of the International Review Committee was to pick and choose a few items of the report and use them to justify a number of not uncontroversial changes

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Continued on page 22



'A Fellow of Another College '

- Robert Dawson

G. H. Hardy, in his "Mathematician's Apology", quotes J. E. Littlewood as saying of the classical Greek mathematicians: "They are not clever schoolboys or 'scholarship candidates', but 'Fellows of another college'." I was reminded of this recently while preparing notes for a geometry class, which I am fortunate enough to be teaching this year.

It is of course well known that Euclid's proof of his first proposition (constructing an equilateral triangle, as the intersection of two circles) is logically flawed; none of his definitions, common notions, or postulates allow us to conclude that two circles intersect. What is surprising is how rare in his work such lapses are, even by modern standards. After getting onto the horse by what we would now consider to be somewhat dubious means, he rides the beast magnificently.

In book I, for instance, he defines area in terms of "scissors equivalence" – two polygons have the same area if one can be cut up into finitely many polygonal pieces which are congruent to the parts of the other. Then in book IX, we see him warming up with parallelohedra in the same way that he did earlier with parallelograms, and we grip the arms of our chairs – we can see that he is riding towards a canyon, as Max Dehn proved in 1900 that this method cannot work in general. But just at the last minute, early in Book X, he turns his horse in a cloud of dust, just short of the rim of the gulch, and finds the volume of a tetrahedron using an early form of integration. The masterful way in which he uses the dissection method up to the limits of its applicability and no further must impress.

Even more astonishing is the way in which, in his first book, he proves almost every result that he can using absolute geometry before bringing out the parallel postulate. With other postulates, there is no feeling of parsimony; he uses them freely. But we sense a reluctance to bring out the parallel postulate before its time. And, looking back from more than two millennia later, we understand perfectly.

Can we imagine that one more stimulating conversation, or a brisk walk on just the right day, might have led Euclid to note the equivalence of the denials of the Parallel Postulate and of many

of the later theorems of Book I, scooping Khayyam and Saccheri? It's not impossible that he might have considered such ideas, I suppose, but probably not as a real alternative, not as finished work, and certainly not in the Elements. (As there would be no record, we're free to speculate!)

To put non-Euclidean geometry on a solid enough footing to publish it (as Menelaus of Alexandria did with spherical geometry about 400 years later), Euclid would almost have had to anticipate Lobachevsky and Bolyai as well – to become, as it were, "Non-Euclid." There, I think, we can safely say we are in the realm of fiction – but it's a fascinating fantasy.

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« Un collègue d'un autre collège »

- Robert Dawson

Dans son ouvrage « Mathematician's Apology » (excuses d'un mathématicien), G. H. Hardy cite J. E. Littlewood, qui a dit, des mathématiciens grecs de l'antiquité, que ces derniers « ne sont pas des écoliers rusés ni des candidats à une bourse, mais bien des collègues d'un autre collège ». Je me suis souvenu de cette citation récemment pendant que je préparais des notes pour un cours de géométrie, que j'ai la grande chance d'enseigner cette année.

Tout le monde sait, bien sûr, que la méthode employée par Euclide pour démontrer sa première proposition (construire un triangle équilatéral, comme intersection de deux cercles) est erronée du point de vue logique : aucun de ses postulats, définitions ou notions courantes ne nous permet de conclure qu'il y a intersection de deux cercles. Ce qui est surprenant, c'est de voir avec quel degré de rareté ces erreurs se produisent dans son travail, même selon des normes modernes. Après avoir monter son cheval selon une méthode que nous considérons aujourd'hui comme étant un peu douteuse, il mène sa bête avec brio.

Dans le livre 1, par exemple, il définit une surface en termes d'« équivalence de ciseaux » – deux polygones ont la même surface si un des deux peut être découpé en un nombre fini de pièces polygonales qui sont congruentes aux parties de l'autre. Dans le livre IX, nous le voyons se réchauffer avec des parallélépipèdes comme il l'avait fait auparavant avec les parallélogrammes... et nous nous tenons fermement dans nos fauteuils – nous voyons qu'il se dirige vers le précipice, car Max Dehn a démontré en 1900 que cette méthode ne peut pas fonctionner en général. Mais à la dernière minute, au début du livre X, il fait demi-tour avec sa monture, dans un nuage de poussière, juste aux abords du précipice en trouvant le volume d'un tétraèdre en employant une forme ancienne d'intégration. Sa façon magistrale de se servir de la méthode de dissection jusqu'à la limite de son applicabilité et pas plus loin est matière à impressionner.

Fait encore plus impressionnant, la façon dont il démontre, dans son premier livre, pratiquement tous les résultats qu'il peut en se servant des principes de géométrie absolue avant d'évoquer le postulat parallèle. Avec d'autres postulats, on ne ressent pas le besoin d'y aller avec prudence; lui s'en sert

en toute impunité. Mais on ressent une certaine hésitation à évoquer le postulat parallèle avant le bon moment. Et, en regardant en arrière après plus de deux millénaires, on comprend parfaitement pourquoi.

Peut-on imaginer qu'une seule autre conversation stimulante ou une marche rapide le bon jour aurait pu faire en sorte qu'Euclide note l'équivalence des réfutations du postulat parallèle et de nombre des autres théorèmes venus plus tard dans le livre 1, ce qui aurait volé la vedette à Khayyam et à Saccheri? Il n'est pas improbable qu'il ait pu réfléchir à de telles idées, je présume, mais ne les aurait probablement pas considérées comme des solutions de rechange réelles, comme du travail fini et surtout pas comme notions qui auraient pu faire partie des Éléments. (Comme il n'y aura pas d'archives, nous pouvons postuler à notre guise!)

Pour asseoir la géométrie non euclidienne sur des fondements suffisamment solides pour qu'on puisse la publier (comme l'a fait Ménélaüs d'Alexandrie avec la géométrie sphérique 400 ans plus tard environ), Euclide aurait été contraint pratiquement de prévoir Lobachevsky et Bolyai aussi pour devenir, comme il se doit « non euclidien ». Je pense que nous pouvons affirmer à cet égard que nous nous trouvons dans le monde de la fiction, mais c'est une histoire fantastique fascinante.



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.

Simplicial Structures in Topology

by Davide L. Ferrario and Renzo A. Piccinini
 CMS Books in Mathematics, Springer, New York,
 253 p., \$59.95. ISBN 978-1441972354.

Reviewed by Sarah Whitehouse, Sheffield University

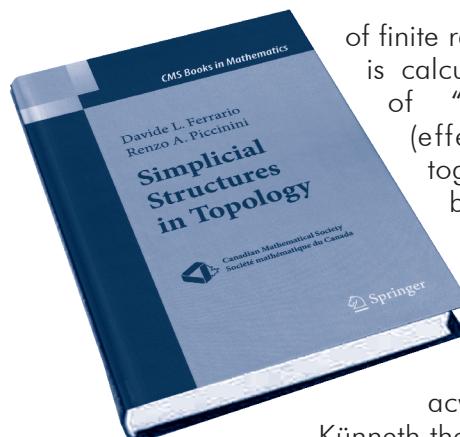
This book is about the topology of finite simplicial structures (rather than simplicial objects in the modern sense). It is based on advanced undergraduate courses given by the authors at the universities of Milano and Milano-Bicocca.

The main topics are finite simplicial complexes and their homology and cohomology. Key results covered include the classification of closed surfaces and the Poincaré duality theorem. The book is designed to be fairly self-contained, starting from elementary definitions and including background material on categorical language and areas such as homological algebra as needed for the development of the subject. The style combines a mixture of formally presented mathematics and more informal discussion.

The book has six chapters. The first covers background topics in topology and category theory needed for the rest of the book. The topological material starts from the definition of a topological space, and covers quotient spaces, continuity, connectedness, compactness, metric spaces, and the Lebesgue number of a cover of a metric space. A brief introduction to the basic terminology of categories, functors and natural transformations is given. Other topics studied include the homotopy category of the category of topological spaces, function spaces with the compact-open topology, the loop-suspension adjunction and group actions.

Chapter 2 covers the category of simplicial complexes, beginning with simplicial complexes in \mathbb{R}^n and proceeding to abstract simplicial complexes (with finitely many vertices). Geometric realization is studied and then homology of simplicial complexes. A subsection of this chapter is devoted to introducing the necessary homological algebra, including the long exact homology sequence of a short exact sequence of chain complexes and a study of chain homotopy. The chapter concludes with a section on homology with coefficients, including a review of the construction of the tensor product, a discussion of the Tor functor and a proof of the universal coefficient theorem for homology.

A polyhedron is defined as the geometric realization of a (finite) simplicial complex and the homology functor on the category of polyhedra is studied in Chapter 3. The homotopy extension property for pairs of polyhedra is proved. Simplicial approximation of maps is explained. Important applications of homology covered in this chapter include the fixed point theorems of Lefschetz and Brouwer and the fundamental theorem of algebra. The homology



of finite real projective spaces is calculated, via a notion of "block homology" (effectively grouping together simplices into blocks corresponding to cells). The final parts of the chapter consider homology of products via acyclic models and the Künneth theorem.

Cohomology is introduced in Chapter 4, in order to take advantage of the extra information available from its ring structure. An elementary example is given to motivate this, of two spaces with the same homology but different ring structures in cohomology. Material studied here includes cohomology with coefficients, the universal coefficient theorem and the definition of the cup product. The chapter concludes with the cap product, needed later for the proof of Poincaré duality.

Chapter 5 covers triangulable manifolds. In particular, closed surfaces are viewed via edge identifications on polygons and the classification of closed surfaces is derived. Poincaré duality is also studied and the Poincaré duality theorem for connected, triangulable, orientable n -manifolds is proved.

Finally, Chapter 6 is about homotopy groups. It begins by defining the fundamental group, carrying out calculations for some standard simple polyhedra and relating the fundamental group to homology. The higher homotopy groups are then defined and elementary properties studied. For the sphere S^n , it is shown that the "lower" homotopy groups are zero and that π_n is \mathbb{Z} . Serre's structural results on the higher homotopy groups are stated without proof. The final section of the chapter gives a brief introduction to obstruction theory, thus linking up homotopy groups to cohomology via obstruction cocycles for map extension problems.

The book is generally well-written (despite the occasional odd translation and typographical error). One quibble is that in a few cases important definitions are a bit hidden in the text. One of the main strengths of the book lies in plenty of motivating discussion and explanation, with good use of examples. There are plenty of exercises at the ends of most chapter sections.

In summary, this is good text for advanced undergraduate students and beginning graduate students in topology. It is potentially useful as a source of project topics for undergraduate students

Concepts in Abstract Algebra

by Charles Lanski,

American Mathematical Society, Providence, RI

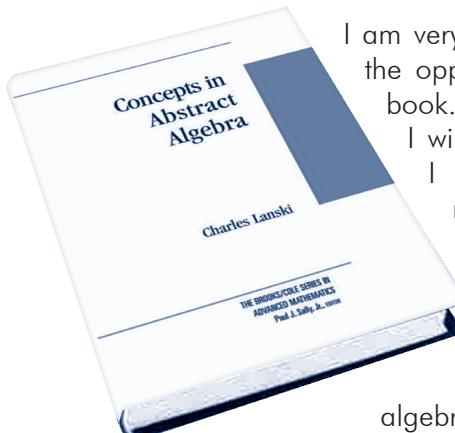
550 p., \$89.00 ISBN 978-0534423230.

Reviewed by Edgar G. Goodaire, Memorial University

One day when I am retired, I am going to read some of the textbooks in my office, the books I have received from publishers over the years and perused just long enough to decide they warranted a spot on a shelf in my office. Being asked to review a book is, of course, motivation to read much (maybe even all) of the book right away. In the case of Lanski's book (published in 2005), this proved to be an enjoyable task. It is the nonstandard and unusual examples and exercises that appeal to me, as an algebraist, the most. Already on page 10, there is a short example describing the intersection of all subsets of R of the form $(-\infty, k] \cup [k+1, \infty)$. (The answer is \mathbb{Z} .)

There is a wide variety of examples showing how the Sylow Theorems can be used to classify groups of some "interesting" orders including 130 and 255, which I had not seen before, and the exercises emphasize applications to general and special linear groups. There is a heavier than typical emphasis on polynomial, power series and Laurent series rings throughout the book. An application of the Eisenstein criterion to establish the irreducibility of a certain polynomial in two variables was the first such I have seen. He uses the usual theorems on group actions and counting orbits to examine a number of "new to me" colouring problems, not just the necklace problem, but cubes and mobiles of varying sorts. There is a great section on the Carmichael numbers and a lot more material on encryption and codes than one expects to find in an undergraduate algebra text.

A few years ago, I was privileged to have a fabulous group of students in a fourth year algebra class whom I was continually trying to challenge. One day, one of the best of that group commented that it was so nice to be getting assignments with problems that did not ask for proofs that a certain structure was a ring or a certain function a homomorphism or to find the kernel of that homomorphism. Andrew would love Lanski's text. In the section that introduces the concept of ring, the first exercise defines the direct sum of an infinite set of rings and asks for a proof that this is a ring. Exercise 3 involves the group ring and Exercise 5 asks for a proof that the intersection of a finite number of subrings of \mathbb{Q} is nonzero.



I am very happy to have had the opportunity to read this book. It is a book to which I will turn for something I should know or remember but don't.

(When is the group of units of \mathbb{Z}_n cyclic?) Bright students with an interest in abstract

algebra will love this book, but at most universities I know, I would consider this a possible textbook only for a good class of students in their final undergraduate year. By contrast, at Memorial University here in St. John's, I have several times used and students seem to have appreciated, Keith Nicholson's book, "Introduction to Abstract Algebra," which I think is friendlier but just as rigorous.

Lanski's book is fast-paced, proofs are highly polished and elegant (great for me, but for my students?) and many exercises are plain and simple hard. In 50 pages, and with the exception of the Schröder-Bernstein Theorem, Chapter 0 (Review) covers most of what our Department teaches in a full semester second year course in discrete mathematics. Localization is treated in Chapter 1 (Preliminaries). There are short answers and/or hints to a few selected odd-numbered exercises in the back of the book. Instead of a list of notation, symbolism like $\mathbf{Z}_p \diamond \mathbf{Z}_q$ appears in the index, so one has to delve into the book and scan a page to see what it means. Some notation, like $\mathbf{Z} D(R)$, is not even in the index. I really do not like the definition of the dihedral group of order $2n$ as $\{W_j, T_j : \mathbf{Z}_n \rightarrow \mathbf{Z}_n \mid j \in \mathbf{Z}, W_j([k]) = [j-k], T_j([k]) = [j+k]\}$ which, for me, makes calculations unnecessarily difficult to follow. Section 2.3 (Groups of Symmetries) is a good read, but the proofs are so concise (yes, elegant) and include so much line upon line of calculation (no displays) as to make them almost unreadable.

The table of contents is more or less standard for an undergraduate text in abstract algebra although, as I have tried to suggest, it contains a number of advanced topics usually left for a graduate text—radicals, localization, noetherian rings, Nakayama's Lemma, irreducible varieties and the Hilbert Nullstellensatz. It's a book I think many algebraists would enjoy reading cover to cover, even if they wait for retirement.

Geometric Spanner Networks

By Giri Narasimhan and Michel Smid,
Cambridge University Press,
500pp. \$114.00 , ISBN 978-0-521-81513-0

The central problem which this book is concerned with - given a finite set of points S in Euclidean space of a given dimension construct a good network that connects them - arises in different forms throughout computational geometry and graph theory with varying measures for the adjective "good". The authors concentrate on the construction of t -spanners which are graphs with vertex set S in which any pair (p,q) is connected by a path of length at most $t|pq|$ and they rigorously develop a set of algorithms for constructing these. For researchers and graduate students in computational geometry this would be a valuable reference.

Piano Hinge Dissections

Greg N. Frederickson,
A.K. Peters, Ltd.,
320pp. \$49.00, ISBN 978-1-56881-299-1

Dissection problems—decomposing a geometric figure into a finite number of pieces that reassemble to give a different figure – have a wide history ranging from popular puzzles to Hilbert's third problem. A special class of these, dissections in which the reassembly is by means of piano hinge joints i.e. folding only along a specified set of edges, is the topic of this book. It is fairly easy to think of simple examples of these, such as the dissection of a triangle using three piano hinge joints which bring the three vertices together at a point on the longest side to give a rectangle (and so illustrate that the sum of the three angles of the triangle is π) but the variety of more complicated examples the author exhibits is quite astonishing. The book has a couple of unusual features. One is that many early results on the topic were discovered in the 1930's by an American architect and amateur geometer, Ernest Irving Freese, and described in an almost lost manuscript, parts of which are reproduced here for the first time. The other is an included CD with videos of the author showing the operation of many of the dissections.

Perspectives in Computation

by Robert Geroch,
Chicago Lectures in Physics,
University of Chicago Press,
208 pp. \$25.00 , ISBN 978-0-226-28855-0

Computation is central to mathematics, both practically and theoretically, and its importance has only increased with the rise of computer science. This book, written by a physicist, provides, as the title says, an interesting perspective on the topic suitable for graduate or advanced undergraduate students. It gives a rigorous definition of the computation process (in which Turing machines play the central role), describes ways of measuring the efficiency of a computation, and concludes with some results about quantum assisted computations. The last part will likely be of most interest to professional mathematicians.

Skew-Orthogonal Polynomials and Random Matrix Theory

by Saugata Ghosh,
CRM monograph series vol. 28,
American Mathematical Society, Providence RI,
127 pp. \$51.00, ISBN 978-0-8218-4878-4

This research monograph develops the theory of skew-orthogonal polynomials, a class of families of polynomials determined by certain double integral identities analogous to the familiar single integral identities determining orthogonal polynomial families. These arise naturally in the study of statistical properties of random matrix models but are expected to have application also in combinatorics, representation theory and the study of certain classes of differential equations. The development parallels the theory of orthogonal polynomials developing recursion relations and a generalization of the Christoffel-Darboux formulas however the resulting theory is significantly more complicated.

Jérôme Proulx, Claudia Corriveau, and Hassane Squalli organized a colloquium at Université du Québec à Montréal (UQAM) in April 2011. The two-day event brought attention to the professional development of teachers of mathematics. This issue of *Education Notes* features an article prepared specifically for the CMS readership. This is a suitable time to remind people that a large number of others interested in educational issues crossing mathematics and pedagogy are not CMS members; however, the CMS reaches out through the public availability of the Notes online. Encourage people in the math educational community at all levels to visit the site at <http://math.ca/notes/> where columns from 1998 to 2011 can be found in the *CMS Notes*. Perhaps new contributors, readers, and members may emerge from this effort.

The co-editors are grateful to Jérôme Proulx who accepted our invitation to prepare this article, and also to Josée Le Bouthillier at University of New Brunswick for her helpful comments on an earlier draft of the article.

Organisation d'un colloque sur la formation mathématique des enseignants de mathématiques

Jérôme Proulx, Université du Québec à Montréal
Claudia Corriveau, Université du Québec à Montréal
Hassane Squalli, Université de Sherbrooke

En avril 2011 à l'Université du Québec à Montréal, un colloque a été organisé sur le thème de la formation mathématique des enseignants de mathématiques au Québec, conjointement par le GREFEM (Groupe de recherche sur la formation à l'enseignement des mathématiques) et le CREAS (Centre de recherche sur l'enseignement et l'apprentissage des sciences, technologies et mathématiques). Pendant deux jours, l'intention de ce colloque était de permettre les échanges et de favoriser le partage entre formateurs d'enseignants de tous horizons et chercheurs, dans le but d'aborder les questions de formation mathématique des enseignants et de progresser sur celles-ci. Dans cette optique, différents points clés ont été proposés et ont servi de cadrage aux diverses présentations et interactions du colloque.

En particulier :

- *État des lieux* : Quelles perspectives et approches sont proposées au Québec pour la formation mathématique des enseignants? Qu'est-ce qui est fait concrètement à la formation initiale pour promouvoir la formation mathématique des enseignants du primaire et du secondaire? Et à la formation continue? Quels sont les choix et les fondements qui motivent ces approches?

- *Orientations et perspectives* : Qu'est-ce qui est souhaité pour la formation mathématique des enseignants du primaire et du secondaire? Et à la formation continue? Quels sont les choix et les fondements qui motivent ces idées?
- *La nature des connaissances mathématiques* : Quelles sont les mathématiques et les pratiques mathématiques qui apparaissent nécessaires pour l'enseignant de mathématiques du primaire et du secondaire?
- *Les cours de didactique des mathématiques* : Quels rôles peuvent et doivent jouer les cours de didactique des mathématiques dans la formation mathématique des enseignants?
- *La prise en charge de la formation mathématique* : Quel type de mathématiques doit être travaillé? Dans quels cours? Par qui ces cours doivent-ils être donnés ? Est-ce que le rôle des cours de didactique des mathématiques est aussi de participer à la formation mathématique des enseignants?
- *La recherche* : Que dit la recherche sur les connaissances mathématiques des enseignants, sur les pratiques de formation mises de l'avant, et sur les orientations et perspectives?
- *Les autres groupes d'enseignants* : Qu'en est-il pour les enseignants en adaptation scolaire et sociale? Et pour ceux en contexte d'immersion? Parmi les perspectives avancées ci-dessus, lesquelles privilégier? Quels sont les choix et les fondements qui motivent ces approches?

C'est donc à ces questions fondamentales que ce colloque voulait s'attarder, voire s'attaquer, dans l'idée de permettre un terrain fertile d'échanges et de débats.

Organisation et structure du colloque

Voulant permettre les échanges entre les participants, le modèle retenu pour le colloque en a été un maximisant les interactions tout en assurant une présentation d'idées riches et réfléchies : des présentations plénières suivies de deux réactions à ces dernières (préparées par les réactants sur la base du texte de la plénière en question), chacune réalisée par différents formateurs et chercheurs de la communauté didacticienne et mathématicienne ; tout ceci complété par de nombreuses plages de discussion, de débats et d'échanges en grand groupe et en sous-groupes. En tout, six plénières ont été offertes et douze réactions aux plénières pour un total de 18 présentations. Parmi les conférenciers et réactants, on compte les personnes suivantes (par ordre d'intervention au colloque) :

- André Boileau (UQAM), *Point de vue sur la formation mathématique des futurs enseignants de mathématiques au secondaire*, avec les réactions de Alejandro González-Martín (UdeM) et d'Anna Sierpinska (Concordia) ;
- Frédéric Gourdeau (ULaval) et Jérôme Proulx (UQAM), *Formation mathématique pour les enseignants de mathématiques du secondaire : Croisement des regards du mathématicien et du didacticien*, avec les réactions de Claudine Mary (USherbrooke) et de Denis Tanguay (UQAM) ;
- Hassane Squalli (USherbrooke), *Quelle articulation entre formation mathématique et formation à l'enseignement des mathématiques? Essai d'analyse et point de vue d'un didacticien des mathématiques*, avec les réactions de Sophie René de Cotret (UdeM) et de Corneille Kazadi (UQTR) ;
- Laurent Theis (USherbrooke), *Quelle formation mathématique pour les futurs enseignants du primaire et du préscolaire? À la recherche des mathématiques dans une séquence sur l'enseignement des probabilités*, avec les réactions de Caroline Lajoie (UQAM) et de Louise Poirier (UdeM) ;
- Adolphe Adihou (USherbrooke) et Cathy Arsenault (UQAR), *Dispositif de formation mathématique pour les enseignants du primaire : choix, caractéristiques, résultats et impacts*, avec les réactions de Michel Beaudoin (UQO) et de Lili Bacon (UQAT) ;
- Helena Osana (Concordia) et Vanessa Rayner (Concordia), *Quelle formation mathématique pour l'enseignant de mathématiques du primaire? Illustrations de recherches et de pratiques*, avec les réactions de Lucie DeBlois (ULaval) et de Jean-François Maheux (UQAM).

À ceci s'ajoute la conférence d'ouverture du colloque, donnée par Nadine Bednarz (UQAM), intitulée *Formation mathématique des enseignants : état des lieux, questions et perspectives*. Cette conférence d'ouverture a permis de dresser un panorama de la recherche et des perspectives de formation au niveau provincial, national et même international, en plus d'offrir des clés d'interprétations porteuses pour l'ensemble du colloque, amenant les divers participants et conférenciers à référer constamment aux idées avancées dans cette conférence d'ouverture. À noter aussi que le premier jour du colloque a été dédié à la formation des enseignants du secondaire et le deuxième jour à celle des enseignants du primaire.

Quelques idées qui ressortent

Il est bien ingrat de vouloir synthétiser, en si peu d'espace, les grandes lignes des échanges d'idées ayant eu cours lors du colloque. Toutefois, quelques idées ressortent qui valent la peine d'être soulignées. Un premier aspect est l'importance, au delà des contenus, de mettre les enseignants en activité mathématique, c'est-à-dire de leur faire faire des mathématiques, de leur faire vivre des expériences mathématiques en les plongeant dans des résolutions de problèmes, dans des réflexions mathématiques profondes et dans des situations authentiques. Pour certains, ceci a pour objectif de faire vivre aux enseignants ce qui est souhaité qu'ils fassent vivre à leurs propres élèves. Pour d'autres, l'intention est de les amener à vivre des mathématiques et à en faire, pour qu'eux-mêmes soient des êtres mathématiques. D'autres encore ont pour but de rendre les enseignants capables de faire des mathématiques, de les explorer et d'être habiles en mathématiques : en un mot, d'être formé à se former soi-même en mathématiques pour permettre de continuer d'en apprendre tout au long de sa carrière. En particulier, cet intérêt partagé par la majorité des participants sur l'activité mathématique est apparu comme un point de jonction ou d'entente possible entre les différents didacticiens et mathématiciens intervenants à la formation des enseignants.

Un deuxième aspect important ressortant du colloque est l'importance de penser l'articulation entre la formation mathématique et celle en didactique des mathématiques. Une des difficultés majeures à cette articulation est le fait que ces deux types de formation, ces deux types de cours (cours de didactique et cours de mathématiques universitaire), ne portent vraisemblablement pas sur les mêmes contenus mathématiques. Toutefois, l'idée d'articulation a mené, au-delà des tensions possibles au niveau des contenus, à se demander comment chacun peut nourrir et se nourrir l'un de l'autre. Ainsi, de quelle façon les mathématiques peuvent-elles nourrir la didactique ? De quelle façon la didactique peut-elle nourrir les mathématiques ? Donc, comment le regard de chacun sur les mathématiques 'peut nourrir l'autre, allant même jusqu'à demander « quelle formation mathématique est travaillée dans un cours de didactique ? » et, à l'opposée, « quelle formation didactique est offerte par un cours de mathématique ? »

Un troisième aspect qui est ressorti concerne le fait que plusieurs semblent s'entendre sur l'importance pour un enseignant d'avoir une bonne formation mathématique, mais que peu définissent ce que signifie une « bonne formation mathématique ». Cette question est demeurée en suspens tout au long du colloque...non sans faute

d'essayer de la clarifier de la part des participants. Toutefois entreprendre de définir ce que signifie une « bonne formation mathématique » n'est pas simple, car cette définition peut varier en fonction de qui répond, pour quelles raisons, dans quel contexte, etc. (voir à ce sujet Bednarz, 2010). Par contre, cette question de clarification ou de définition mène vers deux autres : « Comment se distinguent les mathématiques dans une perspective purement disciplinaire et les mathématiques dans une perspective d'enseignement ? » et « Est-ce qu'il existe différentes mathématiques ou simplement des usages différents des mathématiques ? ». Ces deux questions sont apparues importantes et devront recevoir, dans le futur, une attention particulière par la communauté de formateurs et de chercheurs.

Réflexion d'ensemble sur le colloque

Les questions de formation mathématique ne sont pas nouvelles et apparaissent comme un sujet récurrent. Toutefois, continuer à travailler ces questions aide à faire avancer les réflexions, en offrant des façons de voir et de comprendre ce phénomène sous d'autres angles et par d'autres personnes. Le colloque a permis de bonifier la compréhension de la problématique de la formation mathématique des enseignants de mathématiques et d'ouvrir de nouvelles pistes de compréhension pour les futures recherches, mais aussi pour les futures pratiques de formation.

Toutefois, ces nouvelles pistes de compréhension, autant pour la pratique que pour la recherche, sont uniquement possibles grâce aux acteurs eux-mêmes. C'est le chercheur qui sera influencé par ces idées et conceptualisera à sa façon les questions de formation mathématique, et c'est le formateur qui sera inspiré par ces idées et conceptualisera de nouvelles pratiques de formation. Le colloque, par ses textes et ses discussions, a permis de mettre de l'avant l'aspect personnel, voire les croyances, concernant les questions de formation mathématique et comment telle ou telle chose est bonne ou importante pour la formation mathématique des enseignants de mathématiques. Parfois, une croyance dans la recherche et ses résultats guidait les discussions lors du colloque, alors que parfois une croyance dans « ce qui 'fonctionne ou a fonctionné' » prévalait, entremêlé dans des sentiments profonds, au point d'être palpables, ou des témoignages d'expériences personnelles 'de formés, d'étudiants en mathématiques ou de formateurs. Ainsi, en allant au-delà des contenus mathématiques pour la formation, le colloque a permis d'aller au-delà des besoins de prescriptions et de façon précise et commune de faire la formation mathématique comme communauté : il y a eu la réalisation fréquente,

comme le souligne Biesta (2010), que l'éducation est plus qu'une question de recherche, et qu'elle est aussi une question de valeurs. Les choix de formation pour la formation mathématique sont ancrés dans des valeurs profondes et diverses, et la considération de ces valeurs est importante car c'est avant tout le formateur qui influence la formation qu'il offre. Sans rendre le tout uniquement une question de valeurs où la critique en deviendrait rapidement une de « tout ne peut être bon », il y a la réalisation que la formation mathématique est variée et que ses contextes institutionnels sont variés. Ceci ne réduit pas l'intérêt de vouloir traiter des questions de formation mathématique, bien au contraire, car c'est dans ce partage par des acteurs divers avec des intentions diverses que la génération de nouvelles idées et pistes de réflexion est possible; et c'est ce que ce colloque a permis. En ce sens, le but du colloque a été atteint haut la main!

Pour en savoir plus...

Une autre intention du colloque était de laisser une trace du travail fait, dans le but que ces échanges entre les différents acteurs intervenant sur les questions de formation mathématique stimulent le développement futur de travaux de recherche et de formation sur ces questions. Ainsi, tous les textes présentés au colloque (conférence d'ouverture, plénières et réactions) seront publiés très bientôt sous forme de livre (collectif) aux Presses de l'Université du Québec sous le titre : « Formation mathématique pour l'enseignement des mathématiques : pratiques, orientations et recherches » (sous la direction de J.Proulx, C.Corriveau et H.Squalli). Ceux n'ayant pu assister à cette rencontre pourront, dès 2012, se procurer cet ouvrage et vivre à un certain niveau l'atmosphère dynamique et stimulante provoquée par la richesse des réflexions et des idées échangées et débattues lors de cet excellent colloque. À tous, bonne lecture!

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DON'T BE SEDUCED BY THE ZEROS

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1. The explicit formula. Once we know that there are infinitely many primes, it is natural to ask how many there are up to x . By studying tables of the primes up to 3×10^6 , Gauss understood, as a boy of 15, that the primes occur with density $\frac{1}{\log x}$ at around x , and so the number of primes up to x is approximately $\int_2^x \frac{dt}{\log t}$. This formula is fairly cumbersome, but can be simplified by weighting each prime p with $\log p$. Then Gauss's guesstimate predicts that $\sum_{p \leq x} \log p$ is approximately x . So far, all primes up to 10^{23} have been calculated, and the error term never exceeds \sqrt{x} by much.

How can we approach Gauss's conjecture? We can identify all the composite numbers (and hence all the primes) in $(\sqrt{x}, x]$ by test-dividing by the primes up to \sqrt{x} . This is the sieve of Eratosthenes. Nobody has found a way to use it, or any other sieve procedure, to accurately estimate the number of primes up to x . Indeed, there is no successful approach based on simple intuitive reasoning.

In a nine page memoir written in 1859, Riemann outlined an extraordinary plan to attack the elementary question of counting prime numbers using deep ideas from complex function theory. He begins with the *Riemann zeta-function*, $\zeta(s) := \sum_{n \geq 1} 1/n^s$, which can be extended, in a unique way, to a function that is analytic in the whole complex plane (except at $s = 1$, where it has a pole of order 1). With this analytic continuation, Riemann gave the following remarkable *explicit formula*:

$$\sum_{p \text{ prime}} \log p = x - \sum_{\rho: \zeta(\rho)=0} \frac{x^\rho}{\rho} - \frac{\zeta'(0)}{\zeta(0)},$$

where $p^m \leq x$ and $m \geq 1$. If, as Riemann hypothesized, all zeros ρ of $\zeta(\rho) = 0$ have real part $\leq \frac{1}{2}$, then each $|x^\rho| \leq x^{1/2}$, and we can deduce that the error term in Gauss's guesstimate does not exceed $3\sqrt{x} \log x$.

The *Riemann Hypothesis* is far from proved, but we can learn more from the explicit formula. For example, fix $1 > \beta > 1/2$. Then all zeros of $\zeta(s)$ satisfy $\operatorname{Re}(s) < \beta$ iff $\left| \sum_{p \leq x} \log p - x \right| \leq C_\beta x^\beta$. This is unproved, but the *prime number theorem* (that the number of primes up to x is about $x/\log x$) was proved by Hadamard and de la Vallée Poussin in 1896, by showing that there are no zeros of $\zeta(s)$ very close to the 1-line. Using the explicit formula, we can reformulate many different problems about primes as problems about zeros of zeta-functions, which we can approach through analysis. Mathematicians love to build bridges between apparently disconnected fields, hoping to get a better perspective of both.

These observations are so seductive that they have stimulated most research into the distribution of prime numbers ever since. Moreover, there are many other good questions about prime numbers, number fields, finite fields, curves, and varieties, which can be re-cast in terms of appropriate zeta-functions, so there is no end to what such methods can investigate.

2. Other approaches. Given this tautology between primes and zeros, no lesser authorities than Hardy, Ingham, and Bohr asserted that it is impossible to find an *elementary proof* of the prime number theorem, a feat achieved, however, by Selberg and Erdős in the late 1940s. (Ingham's brilliant Math Reviews note shows how zeta functions lurk just beneath the surface of their work, so that the avoidance of zeros seems more a clever trick than a fundamentally new proof.) There are many other important results about prime numbers whose proofs do not revolve around zeta functions, for instance theorems involving gaps between consecutive primes. Nonetheless, these proofs tend to use whatever tools are needed, including information gathered from zeta function methods, as well as sieve methods, so they tend to be *ad hoc*.

New and quite different techniques have recently achieved great results, where zeta function methods fail to yield much, in the wonderful work of Green and Tao on primes in arithmetic progressions, as well as their recent theorems, with Tammy Ziegler, on a wide variety of prime patterns.

3. The pretentious approach. A multiplicative function f is one for which $f(mn) = f(m)f(n)$ whenever m and n are coprime integers. Important examples include n^{it} for fixed $t \in \mathbb{R}$, $\chi(n)$ where χ is a Dirichlet character, and others that appear in arithmetic as a consequence of the Chinese Remainder Theorem, as well as $\mu(n)$, defined by $\mu(p) = -1$ and $\mu(p^k) = 0$ for all $k \geq 2$, for all primes p . We can show, in an elementary way, that the prime number theorem holds if and only if the mean value of $\mu(n)$, up to N , tends to 0 as $N \rightarrow \infty$.

If we restrict to multiplicative functions satisfying $|f(n)| \leq 1$ for all n , when does the mean value of $f(n)$ not tend to 0? An obvious example is 1, or any example much like 1 (when we perturb the value at each prime by just a small amount). Another example is n^{it} , since the mean value is approximately $\frac{1}{N} \int_0^N u^{it} dt = \frac{N^{it}}{1+it}$; in this case the mean value does not tend to a limit as $N \rightarrow \infty$, but rather rotates around a circle of radius $1/\sqrt{1+t^2}$. Halász's great 1971 theorem proves that these are essentially all the examples: If the mean value of f does not tend to 0, then f looks a lot like n^{it} for some t , i.e. f pretends to be n^{it} . Halász's proof involves Dirichlet series to the right of 1 and Parseval's identity, but doesn't use analytic continuation. This technique has become known as the *pretentious approach*.

Soundararajan and I have improved known results in analytic number theory using Halász's ideas. We worked on the size of character sums, the sizes of L -function values, least non-residues, and convexity problems for L -functions. Most recently Soundararajan and Holowinsky completed the proof of Arithmetic Quantum Unique Ergodicity. Halász's theorem is bound to be a better tool to study more general analytic problems than classical analytic methods, since the Dirichlet series arising from the given multiplicative function does not need to be analytic (which is the main point of using zeta-functions).

Linnik's Theorem states that there exist constants $c, L > 0$, such that if $(a, q) = 1$ there is a prime $\equiv a \pmod{q}$ that is $< cq^L$. Previous proofs have been difficult and important. In

November 2009, Friedlander and Iwaniec presented a new proof, based on sieve methods, for the first time entirely avoiding zeros of zeta functions. This method inspired Soundararajan and I to further develop an idea we had for a *pretentious large sieve*, yielding what is surely the shortest and technically easiest proof of Linnik's Theorem (though bearing much in common with an earlier proof of Elliott).

More importantly, our work on Linnik's Theorem revealed that we could prove all of the basic results of analytic number theory *without ever using analytic continuation*. In the past year we have been developing this new approach. Our goal is to reprove the key results in Davenport's *Multiplicative Number Theory* and Bombieri's *Le Grand Crible* using only "pretentious methods." The past semester I taught the first ever "pretentious introduction to analytic number theory" in Montréal, and 40 junior researchers have signed up to participate in an AMS Mathematical Research Community this summer. We hope these events will go on and help stimulate the development of our methods.

It is believed that the L in Linnik's Theorem can be taken to be any number > 1 ; the current record is 5.2. We do not yet know what our method will yield, but we await a talented, energetic researcher who will advance our ideas and beat the current record.

MENTOR NETWORK

The CMS Women in Mathematics Committee hosted a lunch for women mathematicians at the recent CMS Summer Meeting in Edmonton. The lunch provided an opportunity for us to meet other women mathematicians and to participate in a panel discussion on how we can support and encourage one another. The panellists included: Georgia Benkart (University of Wisconsin), President of the Association for Women in Mathematics; Shannon Fitzpatrick (UPEI), a member of the CMS Women in Mathematics Committee; and Rachel Kuske, (UBC, Department Chair), a founder of and advisor in the AWM mentoring program.

Mentoring, both informal and through formal programs, was a central topic under discussion. One program of particular interest to the participants was the Mentor Network of the Association for Women in Mathematics (AWM). The goal of this network is to match mentors, both men and women, with girls and women who are interested in mathematics or who are pursuing careers in mathematics. The network links mentors with women in various groups, including recent PhD's, graduate and undergraduate students and is open to both members and non-members of the AWM.

CMS members who are interested in becoming mentors or would like to request a mentor can visit the mentor network website at www.awm-math.org/mentornetwork.html and fill out the form provided.

Invariant theory of Killing tensors

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We give a brief account of the *invariant theory of Killing tensors* (ITKT), which is the study of geometric and algebraic properties of Killing tensors defined in spaces of constant curvature. This theory deals with intrinsic properties of Killing tensors in terms of the invariants (covariants, joint invariants, etc.) of the isometry group of the underlying space acting in the corresponding vector space of Killing tensors. As in other invariant theories, ITKT is a bridge between the algebra and the geometry involved, and it can be viewed as an analogue of the classical invariant theory of homogeneous polynomials. There is a duality between the two theories, which has already been exploited. Moreover, some of the techniques used to develop ITKT were applied to solve nontrivial problems in the classical invariant theory of homogenous polynomials, a fact that also proves the duality between these theories, [3].

Due to applications in mathematical physics, it is important to study the Killing tensors of valence two defined in spaces of constant curvature. In 1965, as a first step in the development of the theory, Winternitz and Friš computed a complete set of the isometry group invariants of second-order symmetries of the Laplace equation defined on the Euclidean plane \mathbb{E}^2 . They further used them to classify the orthogonal separable coordinate systems, thus solving the corresponding *equivalence problem* [1]. In 2002, McLenaghan, The, and I independently reproduced and extended these results, using the language of Killing two-tensors, which appear naturally in classical Hamiltonian systems, [2]. We also solved the *canonical forms problem* for the Killing two-tensors defined in \mathbb{E}^2 , deriving for each equivalence class (orbit) in the classification the corresponding *moving frames map*. Since then the development of ITKT has been steady, the corresponding equivalence and canonical forms problems have been solved for Killing two-tensors defined in various spaces of constant curvature, including \mathbb{E}^3 , \mathbb{M}^2 and \mathbb{M}^3 (Minkowski 2- and 3-space), \mathbb{S}^2 and \mathbb{S}^3 (2- and 3-sphere), and \mathbb{H}^2 and \mathbb{H}^3 (hyperbolic 2- and 3-space), [3, 4]. Most of the aforementioned results have been employed to integrate non-trivial Hamiltonian systems via orthogonal separation of variables in the associated Hamilton-Jacobi equations leading to purely algebraic algorithms for solving such systems (see, for instance, the problem of solving the Morosi-Tondo Hamiltonian system in \mathbb{M}^3 , [6]).

Let $(\mathcal{M}, \mathbf{g})$ be a pseudo-Riemannian manifold of constant curvature. A (contravariant) *Killing tensor of valence p* defined in $(\mathcal{M}, \mathbf{g})$ is a symmetric $(p, 0)$ tensor field satisfying the Killing tensor equation

$$[\mathbf{K}, \mathbf{g}] = 0, \quad (1)$$

where $[,]$ denotes the Schouten bracket. When $p = 1$, \mathbf{K} is said to be a Killing vector field (infinitesimal isometry) and (1) reduces to $\mathcal{L}_{\mathbf{K}}\mathbf{g} = 0$, where \mathcal{L} denotes the Lie derivative operator. The solutions of equation (1) form a vector space $\mathcal{K}^p(\mathcal{M})$. Let G denote the isometry group of the pseudo-Riemannian manifold \mathcal{M} . Then, to derive sets of the corresponding invariants, we have to consider the non-transitive group action $G \curvearrowright \mathcal{K}^p(\mathcal{M})$ and study the orbit space $\mathcal{K}^p(\mathcal{M})/G$ to solve the corresponding equivalence and canonical form problems. In most cases such an orbit space has a highly non-trivial topological structure, which complicates the study, [5]. The case $p = 2$ is the most important in applications that use algebraic and geometric properties of the *characteristic Killing tensors* (CKTs), i.e. Killing tensors of valence two with real and distinct eigenvalues and normal eigenvectors. In this case, we can use the classical *method of moving frames*, i.e. formulate and solve the aforementioned problems in the frames of normal eigenvectors of CKTs, [6].

Currently, the theory expands in several directions, including the study of Killing tensors defined in spaces of higher dimensions as well as in the algebraic and the geometric characterizations of Killing tensors obtained with the aid of *joint-invariants*.

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Toute mise en candidature est modifiable et demeurera active pendant trois ans. Veuillez faire parvenir tous les documents par voie électronique, de préférence en format PDF, avant la date limite à prixdb@smc.math.ca

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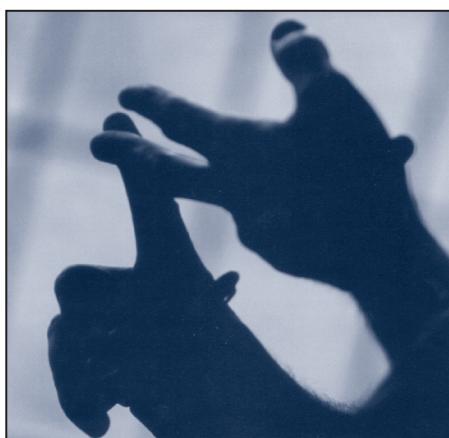
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Friday Vendredi December 9 décembre	Saturday Samedi December 10 décembre	Sunday Dimanche December 11 décembre	Monday Lundi December 12 décembre	SESSIONS
	8:00 – 16:00 - Registration 9:30 – 16:00 - Exhibits 9:30 – 16:00 - Poster Session	8:00 – 16:00 - Registration 9:30 – 16:00 - Exhibits 9:30 – 16:00 - Poster Session	8:00 – 14:00 - Registration	Algebraic Combinatorics Sat & Sun Algebraic Geometry & Commutative Algebra Sat - Mon Analytic Number Theory & Diophan. Approximation Sat & Sun Complex Networks Sun PM & Mon Composition Operators Sat Delay Differential Equations Sat & Sun AM Designs, Factorizations & Coverings Sat & Mon Differential Geometry Sat & Sun Discrete Geometry Sun PM & Mon Dynamics of Climate Impact on Environment & Health Sat & Mon Financial Mathematics Sat & Sun Fluid Dynamics Sun PM & Mon History & Philosophy of Mathematics Sun PM & Monday Mathematical Biology Sat & Sun Mathematics Education Sat & Sun Nonlinear PDE & Applications Sat & Sun Operator Algebras Sat - Mon Probability Sat - Mon Quantum Information Sat & Sun AM Representations of Algebras Sat - Mon Set Theory Sat & Sun
Student workshop (details will be posted to the website shortly)	8:15 – 8:30 Opening 8:30 – 9:20 Craig Tracy Plenary Lecture 9:30 – 10:00 Break 10:00 – 11:30 Scientific Sessions	8:00 – 10:00 Scientific Sessions	8:00 – 10:00 Scientific Sessions	
11:00 – 13:00 Development Group Luncheon (Churchill A, Delta Chelsea)	11:30 – 12:20 Malgorzata Dubiel Adrien Pouliot Lecture 12:30 – 14:00 Break	11:30 – 12:20 Youness Lamzouri Doctoral Prize Lecture 12:30 – 14:00 Break	11:30 – 12:20 Iosif Polterovich Coxeter-James Lecture 12:30 – 14:00 Break	
13:00-17:30 Board of Directors Meetings (Churchill A, Delta Chelsea)	14:00 – 15:00 Scientific Sessions 15:00 – 15:50 Hugh Woodin Plenary Lecture 15:50 – 16:00 Break 16:00 – 17:30 Scientific Sessions	14:00 – 15:00 Scientific Sessions 15:00 – 15:50 Christina Goldschmidt Plenary Lecture 15:50 – 16:00 Break 16:00 – 17:30 Scientific Sessions	14:00 – 16:00 Scientific Sessions	
18:00-19:00 Chris Wild Public Lecture 19:00-20:00 Welcome Reception 20:00 – 22:00 Student Social	18:00-19:00 Kumar Murty Public Lecture (Atrium, Ryerson University)	18:30 - 19:15 Reception (cash bar) 19:15 – 22:00 Banquet		(updated September 19, 2011)

Sessions

Algebraic Combinatorics

Combinatoire algébrique

Org: Nantel Bergeron (York), Mike Zabrocki (York)

Algebraic Geometry and Commutative Algebra

Géométrie algébrique et algèbre commutative

Org: Anthony V. Geramita (Queen's), Gregory G. Smith (Queen's)

Analytic Number Theory and Diophantine

Approximation

Théorie analytique des nombres et approximation diophantienne

Org: Cameron Stewart (Waterloo)

Complex Networks | Réseaux complexes

Org: Jeannette Janssen (Dalhousie), Paweł Prałat (Ryerson)

Composition Operator

Opérateurs de composition

Org: Javad Mashreghi (Laval), Nina Zorboska (Manitoba)

Delay Differential Equation

Équations différentielles à retard

Org: Sue Ann Campbell (Waterloo), Xingfu Zou (Western)

Designs, Factorizations and Coverings

Designs, factorisations et revêtements

Org: Peter Danziger (Ryerson), Lucia Moura (Ottawa), Brett Stevens (Carleton)

Differential Geometry | Géométrie différentielle

Org: Benoit Charbonneau (St. Jerome), Spiro Karigiannis (Waterloo)

Discrete Geometry | Géométrie discrète

Org: Walter Whiteley (York)

Dynamics of Climate Impact on Environment and Health

Dynamiques de l'impact du changement climatique sur l'environnement et la santé

Org: Huaiping Zhu (York)

Financial Mathematics | Mathématiques financières

Org: Matt Davison (Western), Marcus Escobar (Ryerson), Sebastian Ferrando (Ryerson), Pablo Olivares (Ryerson), Luis Seco (Toronto)

Fluid Dynamics | Dynamique des fluides

Org: Serge D'Alessio (Waterloo), Katrin Rohlf, J.P. Pascal (Ryerson)

History and Philosophy of Mathematics

Histoire et philosophie des mathématiques

Org: Tom Archibald (SFU), Craig Fraser (Toronto), Menolly Lysne (Toronto)

Mathematical Biology | Biologie mathématique

Org: Kunquan Lan (Ryerson), Jianhong Wu (York)

Mathematics Education

Éducation mathématique

Org: Walter Whiteley (York)

Nonlinear Partial Differential Equations and Applications

Équations et applications aux dérivées partielles

Org: Almut Burchard (Toronto), Marina Chugunova (Toronto), Catherine Sulem (Toronto)

Operator Algebras | Algèbres d'opérateurs

Org: Pinar Colak (SFU), George Elliott, Zhiqiang Li, Henning Petzka, Adam Sierakowski, Aaron Tikuisis (Toronto)

Probability | Probabilité

Org: Tom Salisbury (York), Jeremy Quastel (Toronto)

Quantum Information | Information quantique

Org: David Kribs (Guelph), Ashwin Nayak (Waterloo), Bei Zeng (Guelph)

Representations of Algebras

Représentations d'algèbres

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

Set Theory | Théorie des ensembles

Org: Ilijas Farah (York)

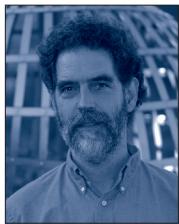
AARMS-CMS Student Poster Session

Présentations par affiches pour étudiants

Org: Jarrod Smith (Regina)

COMITÉ DE LIAISON DU CRSNG POUR LES MATHÉMATIQUES

Walter Craig
McMaster University



Le Comité de liaison du CRSNG pour les mathématiques, dans sa forme actuelle, a été créé en 2007, à la veille de l'examen international du CRSNG, dans le but de représenter le milieu des mathématiques du Canada, dans le cadre des efforts de sélection des membres du comité d'examen international. On y comptait sûrement un ensemble de membres fondateurs tels que Rachel Kuske, Andrew Granville, Jacques Hurtubise et plusieurs autres peut-être, mais je suis arrivé au cours de la réunion d'été de la SMC de 2008, à Montréal. Nous nous sommes réunis, avons créé une constitution, nommé notre premier président (Jacques Hurtubise) et avons entrepris de dresser une liste de candidats mathématiciens au Comité d'examen international du CRSNG et de transmettre cette liste au CRSNG. Nous avons constaté à l'époque que d'autres disciplines semblaient s'être dotées de comités permanents qui avaient pour mandat de communiquer avec le CRSNG, mais que le milieu des mathématiques ne semblait créer des groupes qu'en cas d'urgence liée au CRSNG. Nous avons donc pensé que le moment était venu de devenir, nous aussi, un comité permanent. Nous avons fait un point d'honneur de conserver notre autonomie par rapport aux sociétés mathématiques professionnelles, tout en veillant à inclure des membres de celles-ci, soit de la SMC et du CAIMS en particulier, de même que les directeurs de notre institut, afin de bien représenter le milieu. Tout nous porte à croire que notre premier projet a raisonnablement bien réussi. Le Comité d'examen international du CRSNG a rédigé un excellent rapport où l'on indiquait qu'à ce moment précis le CRSNG dans son ensemble s'en tirait fort bien dans un certain nombre de domaines.

L'information au sujet des activités courantes de notre comité figure sur le site Web du Comité de liaison du CRSNG pour les mathématiques (CLCM pour faire court). Veuillez vous reporter à l'adresse suivante :

https://nmlc.math.ca/blogs/NSERC_Liaison_Committee/blog/2011/04/26/canadian-mathematics-community-statement-about-nserc-discovery-grants/ (en anglais seulement)

Vous y trouverez également la liste des membres actuels du comité. Si vous faites une recherche sur Google, les résultats que vous obtiendrez compteront probablement le nom de plusieurs autres comités de liaison, dont le Comité de liaison du CRSNG pour les mathématiques et

les statistiques (CLCMS) et le Comité de recherche de la Société statistique du Canada . Le but premier du présent article est de décrire la raison d'être et les activités de notre comité (le CLCM). J'essaierai également d'expliquer pourquoi il semble exister un nombre infini de comités aux noms semblables.

Comme on l'indique dans la constitution du CLCM, le mandat est de faire valoir au CRSNG les préoccupations et les objectifs visés du milieu canadien des mathématiques par rapport aux programmes et aux politiques du CRSNG et de rendre des comptes aux membres par le biais des divers représentants. On compte parmi les mesures générales adoptées les nominations décrites ci-dessus de personnes qui siégeront au Comité d'examen international du CRSNG. En plus, nous avons reçu régulièrement, de la part du personnel du CRSNG, des demandes de suggestions pour leurs nominations au Groupe d'évaluation pour les mathématiques et les statistiques (EG 1508), qui classifie nos propositions pour des subventions à la découverte et pour le comité analogue chargé des bourses d'études supérieures du CRSNG. Après l'examen international, nous nous sommes rencontrés à l'occasion, au moins une fois l'an, et Jacques communiquait nos conversations au CRSNG et nous relatait ses conversations avec l'organisme (à l'occasion elles étaient ciblées et critiques, car la réaction du CRSNG au rapport du Comité d'examen international a été de choisir de manière sélective quelques éléments du rapport et s'en servir pour justifier un certain nombre de changements controversés que l'organisme souhaitait apporter). À un certain moment en 2009, on a eu droit à une situation curieuse. Gail Ivanoff, une statisticienne d'Ottawa et la présidente actuelle du comité EG 1508 du CRSNG, a demandé à Jacques de devenir membre d'un comité de liaison qu'on s'apprêtait à créer à la demande du CRSNG, soit le Comité de liaison du CRSNG pour les mathématiques et les statistiques (CLCMS). Les membres de ce comité alternatif sont choisis par le CRSNG (trois membres du personnel du CRNG et deux représentants pour chacun des domaines, soit les mathématiques pures, les mathématiques appliquées et les statistiques). Il s'agit, bien entendu, d'une entité bien plus docile et agréable avec qui le CRSNG établira des rapports, comme on peut l'imaginer. Soit dit en passant, le président des réunions de ce comité est un membre du personnel du CRSNG. Entre temps, les statisticiens et la Société statistique du Canada (SSC) avaient été bien organisés et avaient formé leur propre comité de liaison avec le CRSNG, qui était un sous-comité du Comité de recherche de la SSC.

DU COMITÉ DE DIRECTION DU PLAN À LONG TERME SUITE

Le champ de ces comités de liaison semble être devenu très bondé tout à coup. On peut consulter la liste des membres du CLCMS sur le même site Web du CLCM où l'on retrouve nos propres membres; j'espère que ça vous aidera à bien comprendre les différences. Pour ma part, je suis actuellement le président du CLCM (je n'ai pas eu la chance de me cacher à temps) et membre (surtout pas le président) du CLCMS. Vous pouvez parcourir la présentation qui j'ai donnée au CLCMS le 20 mai dernier sur le site Web du CLCM ci-dessus.

Voici un survol de nos activités actuelles :

Je vous ai brossé un tableau général de notre comité. Je vais maintenant décrire ce que sont nos activités à l'heure actuelle. Les résultats du concours des subventions à la découverte de 2011 du CRSNG ont été annoncés le 24 mars aux divers candidats et à la chaire de leur département. Il était clair que quelque chose du côté mathématique du groupe d'évaluation ne tournait pas rond quand nous avons commencé à entendre des anecdotes au sujet des bourses données à nos amis et collègues. La valeur des catégories de financement cette année (c'est-à-dire le montant par année d'une bourse dans une catégorie donnée), le nombre de candidats dans chacune des catégories et le budget total réservé aux mathématiques et aux statistiques n'ont jamais été annoncés, et ces chiffres n'ont pas été connus avec précision que plusieurs mois après. Le CRSNG ne nous a pas laissé savoir non plus que les catégories de financement pour les statistiques étaient séparées de celles des mathématiques ni que leurs valeurs étaient différentes. Puisqu'il est constitué de mathématiciens, le CLCM a décidé de calculer ses propres estimations des résultats généraux, et a réalisé un sondage à participation volontaire auprès des professeurs de la plupart des grandes facultés de mathématiques et de statistiques à travers le Canada. Après tout, la valeur des catégories est quantifiée. Une fois qu'on possède un certain nombre de données sur les bourses du CRSNG accordées aux personnes, il est facile de reproduire les catégories. Les résultats étaient sans équivoque et fort surprenants. À notre grande surprise, les valeurs dans les catégories pour les mathématiques étaient différentes de celles pour les statistiques. Elles étaient inférieures et, dans bien des cas, bien inférieures. De plus, la différence entre les valeurs des catégories pour les mathématiques cette année et l'an dernier sont négatives pour chacune des catégories, et l'écart est très important pour les catégories du milieu (autant que 9 000 \$ dans la catégorie E, ce qui est un tiers bien compté d'une bourse de la catégorie E). De nombreux mathématiciens en recherche de forte trempe et très actifs ont subi une baisse substantielle de leur bourse, ce qui nuit gravement à leur rendement et les oblige à réduire de beaucoup la portée de leur programme de recherche. Il s'agit là

d'une situation qui fait entorse à nos principes d'équité et à un certain nombre de principes clairement définis du CRSNG, notamment celui de l'attribution de bourses semblables pour des cotations de qualité semblables pour les bourses.

Le 4 mai, le CRSH a publié quelques données préliminaires, qu'on peut consulter à l'adresse suivante :

www.nserc-crsng.gc.ca/_doc/Funding-Financement/DGStat-SDStat_fra.pdf

où les résultats ont été formulés comme des pourcentages, une fois de plus pour que les valeurs des catégories et les budgets généraux soient cachés. En faisant quelques calculs d'algèbre linéaire, nous avons pu obtenir une estimation raisonnable du budget, de même que du nombre de candidats dans chacune des catégories; on retrouve un rapport à ce sujet et la méthodologie du calcul sur le blogue de Nassif Ghoussoub, Piece of Mind <http://nghoussoub.com> (en anglais seulement). Voici les affectations budgétaires pour les mathématiques et les statistiques pour les cinq dernières années; on donne nos chiffres estimatifs pour l'année en cours et le montant réel qui a été annoncé bien après :

- Concours BD 2007 3 895 000 \$
- Concours BD 2008 3 834 000 \$
- Concours BD 2009 3 6754 000 \$
- Concours BD 2010 3 538 000 \$
- Concours BD 2011 3 334 000 \$ (estimation)
- Concours BD 2011 de 3 007 000 \$ (montant réel; l'annonce publique n'a eu lieu que le 13 juin 2011)

Ce qui saute aux yeux, c'est qu'il y a là une séquence dégressive; de 2 %, puis de 4 %, de 4 % et de 14 %. Ces chiffres démontrent que le budget des mathématiques et des statistiques a diminué de 22,8 % au cours des cinq dernières années. Si l'on ajoute à tout cela une estimation modeste du taux d'inflation, il est question d'une baisse en dollars réels de plus de 25 % au cours de la période de cinq ans. À notre avis, il ne s'agit pas d'un financement à la recherche stable des bourses à la découverte pour les mathématiques et les statistiques. Citons parmi les autres effets une baisse du nombre de titulaires d'une subvention et des bourses dont la valeur moyenne s'écarte de la valeur médiane des bourses. Les chiffres finals pour les subventions à la découverte pour le concours EG 1508 des mathématiques et des statistiques sont annoncés dans le budget principal des dépenses du Conseil du Trésor pour 2011-2012, document qui a été publié le 13 juin. Tout cela ne laisse

présager rien de bon pour le financement de la recherche en mathématique au Canada.

Que peut-on y faire? À tout le moins, nous pouvons faire connaître notre point de vue. Le CLCM l'a fait justement dans une lettre ouverte adressée à Suzanne Fortier, la présidente du CRSNG et à Tony Clement (à l'époque, le ministre de l'Industrie, duquel relève le CRSNG; mais après les élections du mois d'avril, une autre personne a été nommée à son poste). Cette lettre compte maintenant plus de 325 signataires, dont nombre de mathématiciens des plus actifs et des mieux connus au Canada. On y demande le financement juste et équitable des bourses de mathématiques et de statistiques, à l'échelle de cette discipline et d'une année à l'autre. On y demande aussi que le CRSNG s'attaque au problème du faible financement des bourses de mathématiques et de statistiques comparativement aux autres sciences. Notre discipline compte de loin les bourses moyennes les moins élevées, soit moins de 20 000 \$ comparativement à la moyenne au CRSNG, qui se situe à environ 34 000 \$. Vous pouvez parcourir cette lettre ouverte sur le site Web du CLCM. Vous pourrez y ajouter votre signature si vous êtes d'accord avec son contenu. Ma présentation au comité de liaison du CRSNG (le CLCMS) s'y trouve aussi; j'y décris des raisons valables pour apporter des changements au modèle axé sur les catégories pour coter nos propositions de bourses à la découverte et je propose des changements concrets. Parallèlement à tout cela, le Comité de planification à long terme prépare actuellement un rapport, qui, on l'espère, aura des effets bénéfiques. Sous la présidence de Nancy Reid, les membres ont obtenu des opinions de gens de tout le milieu des mathématiques et des statistiques au Canada et ont reçu de nombreuses contributions réfléchies et bien articulées. On les trouve sur le beau site Web du comité : <http://longrangeplan.ca/>.

J'ose espérer que nous pourrons convaincre nos agents de programme du CRSNG de trouver une solution à cette situation dans laquelle ils nous ont placé pour le concours de cette année. J'espère aussi que nous pourrons ajuster le modèle axé sur les catégories pour qu'il soit plus souple et plus équitable pour les concours à venir. Je suis toujours abasourdi du fait que le CRSNG semble n'avoir consulté aucun autre organisme subventionnaire donnant des bourses de recherche (notamment la NSF, le CNRS, l'EPSRC, le DFG, le FNS, le CNPq, le CONICYT, l'ERC, le FRF, l'ISF, le NWO, etc.) pour connaître les meilleures pratiques afin d'orienter leurs changements au système d'évaluation des propositions. Il existe toujours d'importants écarts en matière de responsabilisation dans le système du CRSNG; en effet, les décisions régissant l'attribution du budget des bourses à la découverte en mathématiques et en statistiques ne sont pas transparentes.

On constate même que les cotes données par le groupe d'évaluation aux diverses propositions pour des bourses à la découverte sont accordées sans même un rapport sommaire écrit concernant la décision, ce qui est d'ailleurs contraire aux règles publiées du CRSNG. Nous avons beaucoup à faire de notre côté pour que le système soit meilleur et plus équitable. J'espère que tout le monde est prêt à contribuer ses opinions et son temps à titre de membre du groupe d'évaluation ou peut-être à titre de membre du Comité de liaison du CRSNG pour les mathématiques (CLCM).

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McGill

Applied Mathematics
McGill University

The Department of Mathematics and Statistics at McGill University invites applications for a tenure-track position in applied mathematics. While appointments are expected to be made at the Assistant Professor level, more senior applicants would be considered.

The appointment is expected to be in the broad area of differential equations and scientific computing. Applicants should have expertise in both analytical and computational aspects, and an active interest in problems driven by applications.

Candidates must have a doctoral degree at the date of appointment and a strong background in mathematics. They are expected to have demonstrated the capacity for independent research of excellent quality. Selection criteria include research accomplishments, as well as potential contributions to the Department's educational programs at the graduate and undergraduate levels.

Applications should be made through MathJobs.Org (Position ID: McGill-APNUM) and must include a curriculum vitae, a list of publications, a research outline, a teaching statement which includes an account of teaching experience, and at least four references (with one addressing the teaching record). Candidates are also encouraged to provide web links for up to three selected reprints or preprints, or to upload them to MathJobs.Org.

Candidates must ensure that letters of reference are submitted (preferably through mathjobs.org, though in exceptional circumstances they may be mailed to Professor R. Choksi, Applied Mathematics Search Committee, Dept. of Mathematics and Statistics, McGill University, 805 Sherbrooke St. W. Montreal, QC H3A 2K6, Canada).

To ensure full consideration, complete applications including letters of reference should be received by **January 6th 2012**, but later applications may be considered.

McGill University is committed to equity in employment and diversity. It welcomes applications from indigenous peoples, visible minorities, ethnic minorities, persons with disabilities, women, persons of minority sexual orientations and gender identities and others who may contribute to further diversification. All qualified applicants are encouraged to apply; however, in accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada.

which they wished to make). Then at some point in 2009 there occurred a curious moment. Gail Ivanoff, an Ottawa statistician and the current chair of the NSERC EG 1508, approached Jacques with the request that he join a liaison committee being formed at the behest of NSERC, indeed the NSERC - Mathematics & Statistics Liaison Committee (the NSERC-M&S LC). Membership of this alternate committee is selected by NSERC (3 NSERC staff and two apiece of pure math, applied math and statistics) and it is of course a much more docile and agreeable entity for NSERC to liaise with, as one could imagine. Incidentally the chair of the meetings of this committee is an NSERC staff person. In the meantime, the statisticians and the Statistical Society of Canada (SSC) had been quite organized, and had formed their own liaison committee with NSERC, a subcommittee of the SSC Research Committee. The field of these liaison committees seems to have suddenly become quite crowded. A list of NSERC-M&S LC members can be found on the same MNLC website that lists our own members; hopefully it will help you to keep all this straight. My own place in all this is that I am the current chair of the MNLC (I didn't manage to dodge on time) and a member (definitely not the chair) of the NSERC-M&S LC. A presentation that I gave to the NSERC-M&S LC on May 20th can be found on the MNLC website above.

Our present activities:

That is what we are. Now to describe what we are currently doing. The results of the 2011 NSERC Discovery Grants competition were announced on March 24 to the individual applicants and to their department chairs. It was clear that something on the mathematics side of the evaluation group was going wrong, as we started to hear anecdotes of our friends and colleagues' awards. The bin values for this year (that is, the dollar value per year for a grant award in a particular bin), the bin populations, and the total budget allocated for mathematics and statistics were not announced, and these numbers were not known exactly until several months later. Nor did NSERC let us know that the statistics bins were separated from the mathematics bins, or the fact that their values were different. Being mathematicians, the MNLC decided to make our own estimates of the global outcomes, and we made a survey, to which responses were voluntary, of the faculty at most of the main university mathematics and statistics departments across Canada. After all, bin values are quantized, so once you have some amount of data as to peoples' NSERC awards, it is easy to reproduce the bins. The results were pretty clear, and startling. Indeed to our astonishment, in this year's competition mathematicians had different bin values than statisticians, lower and in many cases substantially so. Furthermore the difference between mathematics bin values this year and last year is negative in each bin, and the difference is very large in the middle bins (as much as \$9K in bin E, which is a full third of a bin E grant award). Many fine and very active research mathematicians saw their grants cut by a substantial amount, which severely

affects their productivity and forces them to seriously down-size their research programs. This certainly violates our sense of fairness, as well as violating a number of clearly stated NSERC principles, such as similar grant awards for similar quality ratings for grants, for one.

On May 4 NSERC released a little bit of preliminary data, available at www.nserc-crsng.gc.ca/_doc/Funding-Financement/DGStat-SDStat_eng.pdf where all results were couched in terms of percentages, so that again, bin values and total budgets were hidden. But with a little linear algebra we were able to get a reasonable estimate of the budget, as well as the bin populations; a report of this and the methodology of the calculation appears on Nassif Ghoussoub's blog Piece of Mind. Here are the Mathematics & Statistics budget allocations for the past five years, with the current year giving our estimated figure as well as the actual amount that was announced much later:

- DG 2007 competition \$3,895K
- DG 2008 competition \$3,834K
- DG 2009 competition \$3,675K
- DG 2010 competition \$3,538K
- DG 2011 competition \$3,334K (estimated)
- DG 2011 competition \$3,007K (actual, public announcement only on June 13, 2011)

The one easiest observable trend is that this is a decreasing sequence; by 2%, then 4%, 4% and 14%. These figures show that the Mathematics & Statistics budget has decreased by 22.8% over the past five years. Coupled with a modest estimate for the inflation rate, this leads to a decline in real dollars of over 25% during this five year period. This does not seem to us to be stable research funding for the Discovery Grants to mathematics and statistics. Other effects are the decrease of the number of grantees, and the fact that the mean grant award is diverging from the median award. The final figures as to the Discovery Grants for the Math & Stats EG 1508 are announced in the Canadian Treasury Board's main estimates for 2011-2012, which were posted on June 13. None of these are good news for mathematics research funding in Canada.

What can we do about this? At the very least we can voice our opinion. The MNLC has done so in an open letter to Suzanne Fortier, the President of NSERC and Tony Clement (at the time, the Minister for Industry, under which NSERC is placed). However after the April election there is a new minister). This letter has over 325 signatories, including many of the most active and prominent Canadian mathematicians. It calls for fair and equitable funding for mathematics and statistics grants, across the discipline and

THE MATHEMATICS - NSERC LIAISON COMMITTEE *continued*

from year to year. It also calls for NSERC to move forward on the problem of low funding of mathematics and statistics grants as compared to the other sciences. We have, by far, the lowest of average grants; under \$20K as opposed to the NSERC average of around \$34K. You can find this open letter on the MNLC website, where you can add your signature if you agree with its content. The presentation that I made to NSERC's liaison committee (the NSERC-M&S LC) is available there too; it gives cogent reasons for changes to the conference-bin model for rating our Discovery Grant proposals, and suggests concrete changes. Parallel to all this, the Long Range Planning Committee is working on a report, which we hope will have some positive effects. Under Nancy Reid's chair-ship they have been soliciting opinions very broadly across the landscape of Canadian mathematics and statistics, and they have received numerous thoughtful and articulate contributions, which can be read on their attractive website: <http://longrangeplan.ca/>

I am hopeful that we can convince our NSERC program officers to offer a fix for the situation in which they put us in this year's competition. I am also hopeful that we can adjust the conference-bin model to be more flexible and fairer in subsequent competitions. It still amazes me that NSERC seems not to have consulted any other research grant awarding agency (such as the NSF, the CNRS, the EPSRC, the DFG, the FNS, the CNPq, the CONICYT, the ERC, the FRF, the ISF, the NWO, etc) as to best practices in designing their changes to the system of proposal evaluation. There remain enormous gaps of accountability in the NSERC system; indeed the decisions behind the budget allocation for the DG in Math & Stats are not transparent. And it is even the case that the Evaluation Group ratings of the individual DG proposals are made without a written summary report of the decision; this incidentally is against NSERC's own published rules. There is a lot of work to do from our side to make the system better and fairer. I hope that everyone is willing to contribute your opinions as well as your service as Evaluation Group members or perhaps as Math - NSERC Liaison Committee members.

2010 Tenure Track



Tenure-track position: The Department of Mathematics and Statistics at Queen's University is seeking outstanding candidates for a tenure-track position at the Assistant Professor level, with a starting date of July 1, 2012. Priority will be given to candidates whose research expertise is in Analysis. However, qualified candidates with interests in any field of Pure Mathematics will be considered. Postdoctoral experience is normally expected and a PhD is required. The salary will be commensurate with experience and research record.

The successful applicant is expected to work in an area of Mathematics which complements areas already represented in the Department, to interact with related groups in the Department, and to have demonstrated interest and ability in teaching. For information about the Department, please see www.mast.queensu.ca.

A complete application consists of: an AMS Cover Sheet, a current CV including a list of publications, a Research Statement, and a Teaching Statement. Candidates should also arrange for at least four letters of recommendation, one of which addresses teaching. Applications should be submitted through www.MathJobs.org.

In order to ensure full consideration, applications should be received by **November 5, 2011**.

The University invites applications from all qualified individuals. Queen's University is committed to employment equity and diversity in the workplace and welcomes applications from women, visible minorities, aboriginal people, persons with disabilities, and persons of any sexual orientation or gender identity. All qualified candidates are encouraged to apply, however, Canadian citizens and permanent residents will be given priority. Academic staff at Queen's University is governed by a Collective Agreement between the Queen's University Faculty Association (QUFA) and the University which is posted at www.qufa.ca/ca.



TENURE-TRACK OR TENURED POSITION IN ACTUARIAL MATHEMATICS

The Department of Mathematics and Statistics at Concordia University in Montreal, Quebec invites applications for one position in **Actuarial Mathematics**. Applicants should have a PhD, a strong research and teaching record, and be a Fellow or Associate member (or equivalent) of one of the major North American actuarial organizations, such as the Canadian Institute of Actuaries, the Casualty Actuarial Society or the Society of Actuaries. Associate members will need to commit to complete their Fellowship before the end of their first probationary contract or, for senior appointees, within the first three years of their appointment.

Applications must consist of a cover letter, a current curriculum vitae, copies of recent publications, a statement of teaching philosophy/interests, a statement of research achievements, and evidence of teaching effectiveness. Candidates must also arrange to have three letters of reference sent directly to the departmental contact.

Dr. Yogendra Chaubey

*Chair, Department of Mathematics and Statistics
Concordia University
1455 De Maisonneuve Blvd. W., S-LB 901-7
Montreal, Quebec H3G 1M8
chair@mathstat.concordia.ca
<http://www.mathstat.concordia.ca/>*

Subject to budgetary approval, we anticipate filling this position, normally at the rank of Assistant Professor, for July 1, 2012. A senior appointment may also be considered. Review of applications will begin immediately and will continue until the position has been filled. **All applications should reach department no later than November 1, 2011.** All inquiries about the position should be directed to Dr. Chaubey (chair@mathstat.concordia.ca).

For additional information, please visit our website at artsandscience.concordia.ca.

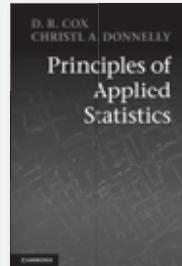
All qualified candidates are encouraged to apply; however, Canadian citizens and permanent residents of Canada will be given priority. Concordia University is committed to employment equity.

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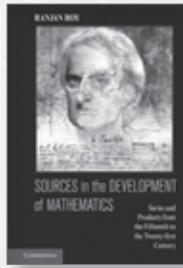


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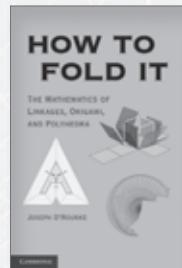


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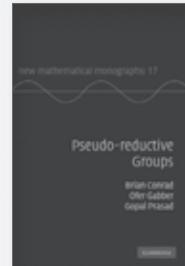
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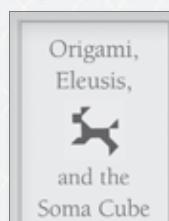
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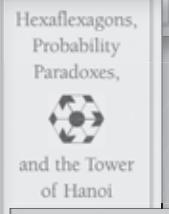
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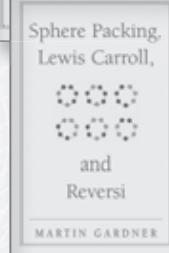
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CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

OCTOBER	2011	OCTOBRE	JANUARY	2012	JANVIER
10 – 14	Weighted singular integral operators and non-homogenous harmonic analysis, AIM Workshop (Amer. Inst.of Math, Palo Alto, CA) http://aimath.org/ARCC/workshops/singularintops.html		17 – 18	International Conference on Math Sciences and Applications (New Delhi, India) http://ijmsa.yolasite.com/conference-announcement.php	
17 – 21	Applications of Kinetic Theory and Computation (ICERM, Brown University, Providence, RI) http://icerm.brown.edu/sp-f11/workshop-2.php		4 – 7	AMS Joint Mathematics meetings (Boston, MA) www.ams.org/meetings/national/jmm/2138_intro.html	
24 – 26	Algebra, Geometry, and Mathematical Physics (Mulhouse, France) www.agmp.eu/mul11		9 – 13	AIM Workshop: Mapping theory in metric spaces (Palo Alto, CA) http://aimath.org/ARCC/workshops/mappingmetric.html	
24 – 27	SIAM Conference on Geometric and Physical Modelling (Orlando, FL) www.siam.org/meetings/gdspm11/		23 – 27	Set Theory and C*-algebras (Amer. Inst.of Math, Palo Alto, CA) http://aimath.org/ARCC/workshops/settheorycstar.html	
24 – 28	Heritage of Galois' work (IHP, Paris, France) www.galois.ihp.fr/				
26 – 29	Integers Conference 2011 (University of West Georgia, GA) www.westga.edu/~math/IntegersConference2011/				
31 – Nov 4	Geometry of large networks (Amer. Inst.of Math, Palo Alto, CA) http://aimath.org/ARCC/workshops/largenetworks.html				
NOVEMBER	2011	NOVEMBRE	FEBRUARY	2012	FÉVRIER
7 – 11	Klein project (Amer. Inst.of Math, Palo Alto, CA) http://aimath.org/ARCC/workshops/kleinproject.html		13 – 17	ICERM Workshop: Complex and p-adic Dynamics (Providence, RI) http://icerm.brown.edu/sp-s12/workshop-1.php	
7 – 11	Waves in Science and Engineering 2011 (Mexico City, Mx) www.wise.ipn.mx/		20 – 24	AIM Workshop: Stochastic Dynamics of small networks of neurons (Palo Alto, CA) http://aimath.org/ARCC/workshops/neuronnetwork.html	
19 – 21	International Conference on Analysis and its Applications (Aligarh, India) www.amu.ac.in/conference/icaa2011				
28 – Dec 2	School of Applied Math and Innovation 2010: Celestial Mechanics and Computing Orbits (Carrera, Columbia) http://ima.usergioarboleda.edu.co/SAMI/SAMI2011.htm				
DECEMBER	2011	DECEMBRE	MARCH	2012	MARS
5 – 9	Stability, hyperbolicity, and zero localization (Amer. Inst.of Math, Palo Alto, CA) http://aimath.org/ARCC/workshops/hyperbolicpoly.html		12 – 16	Classifying fusion categories (Amer. Inst.of Math, Palo Alto, CA) http://aimath.org/ARCC/workshops/fusioncat.html	
10 – 12	CMS Winter Meeting Ryerson University and York University, Toronto, ON www.cms.math.ca		25 – 28	Partial Differential Equations and Applications (Hanoi, Vietnam) http://aimath.org/ARCC/workshops/neuronnetwork.html	
15 – 17	Applied Mathematics & Stochastic Processes (Sacred Heart College, Chennai, India) www.shctpt.edu				
17 – 18	International Symposium on Biomathematics and Ecology (Portland, OR) www.biomath.ilstu.edu/beer		APRIL	2012	AVRIL
			16 – 20	ICERM Workshop: Moduli Spaces associated to Dynamical Systems (Providence, RI) http://icerm.brown.edu/sp-s12/workshop-3.php	
MAY	2012	MAI			
20 – 27	European Conference on Elliptic and Parabolic Problems (Gaeta, Italy) www.math.uzh.ch/gaeta2012		28 – June 3	Theory of Approximation of Functions and Applications (Kamianets-Podilsky, Ukraine) www.imath.kiev.ua/~funct/stepconf2012/en/	
JUNE	2012	JUIN	2 – 4	CMS Summer Meeting University of Regina, Regina, SK www.cms.math.ca	



Fields Institute, Toronto, Canada Postdoctoral Fellowships

Description: Applications are invited for postdoctoral fellowship positions for the 2012-2013 academic year. The Thematic Program on Forcing and its Application will take place at the Institute July to December 2012. 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. There will also be a number of two year positions available connected to the Fields-Ontario 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, 2011 although late applications may be considered.

Application Information: Please consult www.fields.utoronto.ca/proposals/postdoc.html

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December / décembre	September 29 / le 29 septembre		
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¤ TITLES FROM THE AMS ¤



TURBULENT TIMES IN MATHEMATICS THE LIFE OF J.C. FIELDS AND THE HISTORY OF THE FIELDS MEDAL

Elaine McKinnon Riehm and Frances Hoffman

Drawing on a wide array of archival sources, Riehm and Hoffman provide a vivid account of Fields' life and his part in the founding of the highest award in mathematics. Filled with intriguing detail—from a childhood on the shores of Lake Ontario, through the mathematics seminars of late 19th century Berlin, to the post-WWI years of the fragmented international mathematical community—it is a richly textured story engagingly and sympathetically told. Read this book and you will understand why Fields never wanted the medal to bear his name and yet why, quite rightly, it does.

—June Barrow-Green, Open University, Milton Keynes, United Kingdom

J. C. Fields, the foremost Canadian mathematician of his time, was educated in Canada, the United States, and Germany, and championed an international spirit of cooperation to further the frontiers of mathematics. It was during the awkward post-war period that J. C. Fields established the Fields Medal, an international prize for outstanding research, which soon became the highest award in mathematics. J. C. Fields intended it to be an international medal, and a glance at the varying backgrounds of the fifty-two Fields medallists shows it to be so.

Who was Fields? What carried him from Hamilton, Canada West, where he was born in 1863, into the middle of this turbulent era of international scientific politics? A modest mathematician, he was an unassuming man. This biography outlines Fields' life and times and the difficult circumstances in which he created the Fields Medal. It is the first such published study.

A co-publication of the AMS and Fields Institute.

2011; approximately 256 pages; Softcover; ISBN: 978-0-8218-6914-7; List US\$45; AMS members US\$36; Order code MBK/80

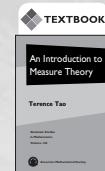


THE GAME OF COPS AND ROBBERS ON GRAPHS

Anthony Bonato, *Ryerson University, Toronto, ON, Canada*, and Richard J. Nowakowski, *Dalhousie University, Halifax, NS, Canada*

This book is the first and only one of its kind on the topic of Cops and Robbers games, and more generally, on the field of vertex pursuit games on graphs. The reader will gain insight into all the main directions of research in the field and will be exposed to a number of open problems.

Student Mathematical Library, Volume 61; 2011; 276 pages; Softcover; ISBN: 978-0-8218-5347-4; List US\$45; AMS members US\$36; Order code STML/61



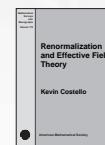
AN INTRODUCTION TO MEASURE THEORY

Terence Tao, *University of California, Los Angeles, CA*

This is a graduate text introducing the fundamentals of measure theory and integration theory, which is the foundation of modern real analysis. The material is intended to cover a quarter or semester's worth of material for a first graduate course in real analysis.

There is an emphasis in the text on tying together the abstract and the concrete sides of the subject, using the latter to illustrate and motivate the former. There are a large number of exercises throughout that develop key aspects of the theory, and are thus an integral component of the text.

Graduate Studies in Mathematics, Volume 126; 2011; 206 pages; Hardcover; ISBN: 978-0-8218-6919-2; List US\$53; AMS members US\$42.40; Order code GSM/126



RENORMALIZATION AND EFFECTIVE FIELD THEORY

Kevin Costello, *Northwestern University, Evanston, IL*

This book makes perturbative quantum field theory accessible to mathematicians with no prior experience in the subject. The author's insightful use of the renormalization group and effective field theory could help to launch a wider use of the topics. The book also assists physicists in learning the powerful methodology of mathematical structure.

Mathematical Surveys and Monographs, Volume 170; 2011; 251 pages; Hardcover; ISBN: 978-0-8218-5288-0; List US\$84; AMS members US\$67.20; Order code SURV/170

Also of interest

INTRODUCTION TO ORTHOGONAL, SYMPLECTIC AND UNITARY REPRESENTATIONS OF FINITE GROUPS

Carl R. Riehm

Fields Institute Monographs, Volume 28; 2011; 291 pages; Hardcover; ISBN: 978-0-8218-4271-3; List US\$99; AMS members US\$79.20; Order code FIM/28

ALGEBRAIC CURVES AND CRYPTOGRAPHY

V. Kumar Murty

Fields Institute Communications, Volume 58; 2010; 133 pages; Hardcover; ISBN: 978-0-8218-4311-6; List US\$79; AMS members US\$63.20; Order code FIC/58

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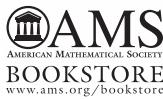
Dmitry Jakobson, Stéphane Nonnemacher, and Iosif Polterovich

CRM Proceedings & Lecture Notes, Volume 52; 2010; 207 pages; Softcover; ISBN: 978-0-8218-4778-7; List US\$99; AMS members US\$79.20; Order code CRMP/52

MONOIDAL FUNCTORS, SPECIES AND HOPF ALGEBRAS

Marcelo Aguiar, and Swapneel Mahajan

CRM Monograph Series, Volume 29; 2010; 784 pages; Hardcover; ISBN: 978-0-8218-4776-3; List US\$169; AMS members US\$135.20; Order code CRMM/29



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