CMS NOTES de la SMC

FROM THE VICE-PRESIDENT'S DESK
V. Kumar Murty, *University of Toronto*

Pure and Applied Research in Mathematics

We have become accustomed to classifying mathematical research, and mathematicians, into various categories such as pure (or basic or fundamental), applied, industrial and so on. However, we know that historically, these classifications were either not prevalent or dominant. Scientists such as Aryabhatta whose primary interest was astronomy also worked on solutions of what are today called linear Diophantine equations. Gauss worked on many problems including quadratic reciprocity, primitive roots and probability theory as well as electric forces and planetary motion. In fact, for several decades, Gauss was professor of astronomy at Göttingen. We can give many more such examples, all of which illustrate that in the classical world, there was much less compartmentalization of mathematical activity.

Cross disciplinary work is not altogether absent even in our own time. Notable examples include Mumford, an algebraic geometer working on the problem of face recognition, Tao who works in many fields, including number theory as well as in remote sensing, and Dyson, a physicist who has made contributions to number theory. However, by and large, we tend to be fairly compartmentalized and rigid in the problems that we choose to work on, making it possible to continue to classify our work (and ourselves!) as either pure or applied.

This rigidity has partly to do with the scientific advances that have been made in every field. It is difficult enough to keep up with the developments in one's own specialty that we may not feel that we have the luxury of wandering into other domains. Given the volume of work already in existence, we may have qualms about our ability to contribute in a meaningful way in an area that is relatively new to us.

Partly, it has also to do with the requirements of funding agencies. Applications for funding have to be assigned to committees or subcommittees with specific domain expertise and we might hesitate to submit a proposal that the committee would find difficult to classify. Perhaps it has also to do with the overall increase in the size of the world wide mathematical community. Increase in size seems to be accompanied with an increase in the perceived need for classification and compartmentalization, and this applies not only to research but also to teaching.

However, new directions of study are opening up problems that require the combined efforts of mathematicians, both pure and applied, as well as scientists of other disciplines. These directions are creating areas of research which we cannot clearly demarcate as pure or applied.

The first area that comes to mind is in problems that arise from Information Technology. With the introduction of elliptic curves as a source of cryptographic key-sharing algorithms, the discrete logarithm problem acquired great practical importance. This problem can be stated for any cyclic Abelian group G for which we are given a generator g (say). Any other element h of G is a power of g and the discrete logarithm problem is to algorithmically determine that power. We note that this is not really a mathematical problem, but a computational one which depends entirely on the manner in which the group is presented.

EDITORIAL

by Srinivasa Swaminathan
Dalhousie University, Halifax

Allez en avant, et la foi vous viendra
- Jean d'Alembert

Many freshmen who start their university mathematics courses with Calculus switch to Statistics for the second term. The reason given usually for this switch is: 'Integral calculus is more difficult'. Apparently this behavior goes back to the eighteenth century. The above quote, which means 'Push on and faith will catch up with you,' was d'Alembert's advice to those who questioned the calculus.

Some students switch due to prejudices which have developed towards mathematics for generations. A common point of view is represented by the oft-repeated question, "Unless a person expects to teach mathematics, what need is there for studying courses in mathematics beyond the elementary?" Such a question is echoed by the scientist who says, "I learnt my mathematics in my courses in science," and by the industrialist, "I do not know what to do with a mathematician after I employ him, for it has been the experience of some other industries that he is unable to isolate and frame the problems that arise in concrete situations."

For many students the primary object of taking courses is to pass examinations and getting a good grade rather than to learn and understand clearly the subjects. Even those students who do well in the first term prefer to switch since their grades would be much better in a statistics course and this would help for admission to medical studies.

Further, since first-year courses are taught in classes containing a large number of students with diverse levels of understanding, it is not surprising that there are those who wish to switch to apparently easier courses.

Students choose their courses mostly either on their own or influenced by what their friends do. They seldom seek advice from instructors or professors. It is difficult to tell what the reasons are; they may be quite idiosyncratic. A colleague of mine told me that he had inquired one of his students why he switched to statistics for the second term, and he got the following reply: 'I joined your Calculus section because Judy was in it. When she switched to statistics I just followed her.'

Some students may switch out because they have not overcome long-standing anxiety about mathematics. For others, the subject matter may not have been presented in a pleasing or captivating form. Some beginning instructors are keen and innovative, others are teaching only because the department requires them to do so as part of their graduate funding. Among the seasoned veterans, we find some who are excellent calculus teachers, but also some who would be far more comfortable teaching graduate courses. These problems need to be dealt with at an individual level.

For some students, of course, switching to stats is the right thing to do; for them, the calculus-statistics sequence can be formalized. For others, the traditional course on «how to integrate nearly anything» is ideal. What about the other students? Various alternatives that have been tried include a non-rigorous course in integration and applications, and a course on sequences, series and financial management. Instructors of the first term may interview students after the midterm examinations and advise them on an appropriate choice of second term courses depending on the student's performance, their aptitudes and goals. (And the student can always see Judy at lunch.)

ÉDITORIAL

par Srinivasa Swaminathan
Dalhousie University, Halifax

Allez en avant, et la foi vous viendra
- Jean d'Alembert

En première année de mathématique, nombreux sont les étudiants qui se lancent en calcul à la première session et optent plutôt pour la statistique à la deuxième. La raison principale invoquée? « Le calcul intégral est plus corsé. » Ce comportement daterait en fait du 18e siècle. La citation de d'Alembert ci-dessus résume le conseil que celui-ci donnait à ceux et celles qui doutaient de la valeur du calcul.

Certains étudiants abandonnent le calcul en raison de préjugés dont les mathématiques font l'objet depuis des générations. La question suivante, entendue si souvent, reflète un avis commun : « À moins de vouloir enseigner les mathématiques, pourquoi faudrait-il l en étudier plus que la base? » Cet avis est renforcé lorsque les scientifiques disent « J'ai appris mes mathématiques dans mes cours de sciences », et lorsque les industriels admettent : « Je ne sais pas quoi faire des mathématiciens après les avoir engagés, parce que l'expérience d'autres secteurs montre que ces personnes sont incapables de cibler et de cerner des problèmes de la vraie vie. »

Bon nombre d'étudiants suivent des cours surtout pour en réussir les examens et y obtenir de bonnes notes, au lieu d'en maîtriser et d'en saisir clairement la matière. Même les étudiants qui réussissent assez bien en calcul à la première session préfèrent changer de cours, car leurs notes en statistique seraient beaucoup plus fortes et favoriseraient l'admission en médecine. De plus, puisque le nombre d'étudiants dans les cours de première année est souvent si grand et leur niveau de compréhension est si varié, il ne faut pas s'étonner qu'une proportion de ces classes veuille opter pour des cours jugés plus faciles.

Les étudiants choisissent leurs cours soit selon leur propre jugement, soit d'après ce que font leurs amis. On demande rarement conseil au personnel enseignant. Il est difficile de déceler les motifs de leurs choix – qui peuvent d'ailleurs être bien singuliers. Un de mes collègues a justement demandé à un étudiant pourquoi il avait opté pour un cours de statistique à la deuxième session. La réponse : « En première session, je me suis inscrit à votre cours de calcul parce que Judy le suivait aussi; quand elle a changé pour un cours de statistique, je l'ai suivie là. »

Il se peut que certains étudiants changent de cours en raison d'une anxiété chronique des mathématiques. D'autres ont peut-être décroché à cause d'une présentation peu captivante ou peu plaisante de la matière. Il est vrai que certains professeurs débutants apportent effervescence et innovation à leur enseignement, alors que d'autres s'y soumettent strictement parce que leur unité scolaire l'oblige comme préalable au financement des études supérieures. Parmi le corps professoral chevronné, on trouve tantôt des bijoux en enseignement du calcul, tantôt d'autres qui se plairaient beaucoup mieux à enseigner aux études supérieures. Il faut traiter de ces défis cas par cas.

Chose certaine, certains étudiants ont raison de passer du calcul à la statistique, et la séquence calcul-statistique peut être « officialisée » dans leur cas. D'autres trouvent parfaitement bien leur compte dans un cours qui, disons, « montre comment intégrer à peu près tout avec tout ». Qu'en est-il de tous les autres, cependant? On a proposé entre autres un cours moins rigoureux en intégration/applications, ainsi qu'un cours sur les séquences, les séries et la gestion financière. Les professeurs à la première session peuvent passer les étudiants en entrevue après les examens de mi-session et leur conseiller le meilleur choix de cours à la lumière de leur rendement, de leurs aptitudes et de leurs buts (et, bien sûr, l'étudiant pourra toujours voir Judy au dîner…).

Letters to *the* Editors
Lettres *aux* Rédacteurs

Directed Algebraic Topology
Models of Non-Reversible Worlds

by Marco Grandis,
New Mathematical Monographs (No. 13),Cambridge
University Press, 2009.
ISBN: 9780511654565 $76.00.

Reviewed by Tim Porter, University of Wales, Bangor

Before starting on a description of the book as such, let us consider what its subject is, as that will explain to some extent the book's structure.
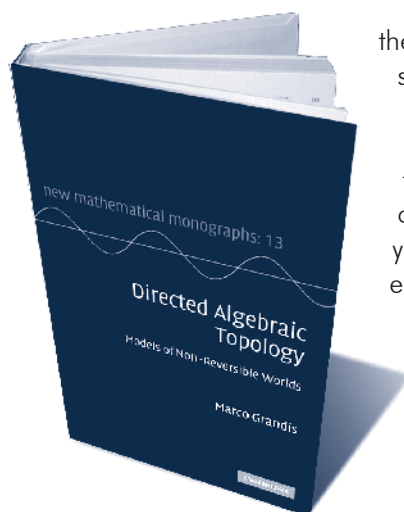
Algebraic topology studies topological spaces using algebra such as groups, groupoids, modules, chain complexes, etc. One of its central branches is homotopy theory, which studies homotopies between maps between spaces.

What then is `directed algebraic topology'? Clearly one would guess that directed algebraic topology studies directed topological spaces using, perhaps, 'directed algebra' - but what is 'directed algebra' the term is probably ambiguous? - so let us continue ... . One of the central branches of directed algebraic topology is directed homotopy theory, which studies directed homotopies between directed maps between directed spaces.

Apart from the gaps, what is said above is more or less true, but in order to fill the gaps, you have to be precise about directed spaces, directed maps, directed homotopies, etc., then the directed algebra `should' come to the surface. To get a working and useful theory, you need a stack of examples and to keep in mind where they come from, i.e., the examples will relate to actual and potential applications.

The basic and initial idea of a directed space (but not the only one that we will meet or need) is that of a *pre-ordered space*, that is a space X together with a closed pre-order, $\leq$, on it. (A pre-order is a reflexive and transitive relation and it is closed if its graph is a closed subset of $X \times X$.) There is an obvious notion of directed map, namely a continuous map that respects the order and, in particular, if we have a directed space X, we can say what a directed path is. We take $\uparrow I = ([0, 1], \leq)$, that is, giving the unit interval the usual order, $\leq$, and then a directed path, a, in X is simply a directed map, $a :\uparrow I \to X$.

Given the fundamental importance of paths in homotopy theory and of related ideas in other parts of algebraic topology, it is clear that directed paths are going to be central to directed algebraic topology. (Recall that one intuition about homotopies is that they are paths in a space of maps.) When one starts to understand directed paths and how they behave then the development of the theory in this book becomes much clearer and the reasons for some of the complications and the choices made almost self evident. So how do directed paths behave? In classical undirected topology, we have a concatenation operation - you put composable paths end to end to get a longer path, then reindex. The reindexing gives some slight bother, but not that much. The same process works beautifully for directed paths. What about the constant paths that serve as the identities (up to homotopy)? 'Directed constant path' makes sense, but we need the analogues of homotopies.

This thought experiment now hits some problems, or rather 'choices'. The obvious definition of a directed homotopy between directed maps $f^-, f^+ : X \to Y$, would be a directed map

$$h : X \times \uparrow I \to Y$$

satisfying analogues of the usual rules. This makes sense and works well, but, whilst classically homotopy gave an equivalence relation on $\mathrm{Top}(X, Y)$, directed homotopy defined in the above way only gives a preorder on the corresponding $\mathrm{PTop}(X, Y)$. Why? Simply because symmetricity fails.

To show homotopy is a symmetric relation, you use the reversing map,

$$r : I \to I;$$

$$r(t) = I - t;$$

but, of course, that reverses the order, so is not a directed map and so we cannot, in general, reverse directed homotopies. Likewise we cannot reverse directed paths. We can generate an equivalence relation from the preorder to get a way of composing (classes of) directed paths in an associative way and to have identities. This is fine, but is squashing the directedness of the homotopies used.

What, therefore, should we expect as the basic directed homotopy invariant of a preordered space - not a fundamental group or groupoid, but a fundamental monoid or category - as we will not have reverse paths, so cannot hope for inverses.

If you try to develop a detailed theory of directed homotopy, you need to be very careful. So many constructions in basic cylinder based homotopy theory subtly require a choice to be made.

For instance, if we have an undirected space, X, with a base point there is a very useful space of paths in X starting at that basepoint. If now, X is directed (so think 'pre-ordered' for the moment), in the directed analogue, should the paths start or end at the base point. Normally, classically, it did not matter, but now in the directed world of directed paths, not only are the two choices unrelated, but the difference interprets an important idea. Directed paths that *start* at the base point tell us about the 'future behaviour' of the space locally at the base-point, whilst those that *end* there relate to 'past behaviour'. (In some of the examples and applications, this is crucial.)

This sort of 'choice' is typical and it shows the inherent richness of the subject as it encodes the spatial and order structure in a very detailed way. the point to note is that in facing the 'choice' you realise that you need to have both aspects as either one by itself will not give anything like an accurate picture. There will be dualities around, of course. To each pre-ordered space X there is another X^{op}, which has the same underlying space but with the reversed pre-order. Arguments and constructions do not always need repeating, but the interplay between the two sides 'past' and 'future' can get subtle.

This need to take a great deal of care means that, in developing the background theory of basic directed homotopy attention to detail is of first importance right from the start. That is well exemplified in this book, which is the first monograph to look at directed homotopy and other parts of directed algebraic topology in detail. Great care is taken to lay down each choice, exploring the consequences fully, examining the related constructions of classical homotopy theory for hidden uses of further choices. (The possibility of order reversal often occurs in classical arguments without explicit mention.) There are lots of choices, so initially progress in the development of the theory may seem quite slow, but that development is very detailed and precise, and equally well very necessary to *avoid* some natural, but in general unwarranted, assumptions.

In fact, the category of pre-ordered spaces has a few deficiencies. These are both in its categorical structure and in its usefulness for modelling interesting situations. It has, for example, no 'directed circle' object, yet this would be useful even essential for handling cyclical processes. This is linked to the fact that the category, PTop, of pre-ordered spaces does not have quotients. For example, taking $(\mathbb{R};\geq)$, we have a natural embedding of $(\mathbb{Z};\geq)$, but we cannot form a quotient $\mathbb{R}/\mathbb{Z}$ in any geometrically sensible way, although the unique map from $\mathbb{Z}$ to a single point is a map of pre-ordered spaces. If we had such a quotient, then it would look something like
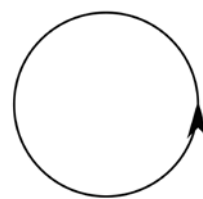
hence would be a suitable directed circle, where 'directed' denitely has quite usual 'common sensical' meaning, yet is *not* synonymous with 'ordered'. (There is an idea of 'locally pre-ordered spaces', but those are not the route explored in detail in this book, although the theory developed in this book does apply in those situations. For a direct development of their directed homotopy, see, for example, Fajstrup, Goubault and Raussen, [1], or Krisnan, [3], amongst several others (who can be found by a websearch).)

If we use such a directed circle, we could discuss directed loops in 'directed spaces'. Restricting, again, to pre-ordered spaces however, we would have that the only directed loops would be in parts of the space where the order was chaotic, that is, $x \leq y$ for all pairs of elements in that region, and if, further, the pre-order is a partial order, (hence is anti-symmetric), the only directed loops will be constant. That would be a severe restriction both for structural and for pragmatic reasons, i.e. it would restrict the potential for modelling processes. The solution proposed in the book is to introduce a notion of space with distinguished loops, called a *d-space*, that is a space X, with a set, dX, of distinguished continuous paths, $a : I \to X$, which contains the constant paths, is closed under reparametrisation (using weakly increasing maps on I) and also is closed under concatenation. There is an obvious notion of a d-map between d-spaces and any pre-ordered space becomes a *d-space* if we choose dX to be the set of directed paths. (It is also the case that most constructions that could be reasonably performed on pre-ordered spaces, give the same result when extended to d-spaces, so this enriches the setting without changing the interesting structure.)

We need a few examples and applications before we look at the book in detail, so as to 'put some flesh' on these ideas and to illustrate some more of the subtleties of the theory.

Example 1. The Swiss flag space is the complement of a cross shaped region in a directed square,
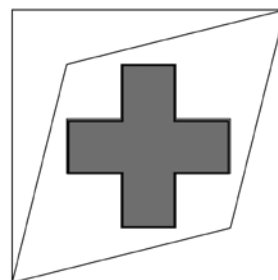
with the product pre-order ($(x, y) \leq (x', y')$ if and only if $x \leq x'$ and $y \leq y'$). Directed paths are those going up and to the right. The classical homotopy theory of the space is that of a circle. The directed homotopy is a good deal more subtle. (The dark shaded part of the picture is omitted from the space. The slanting lines show two typical directed paths from the bottom left to the top right.)

This specific example occurs in simple situations within computer science and is one of a family of such directed spaces that occur in the more complicated versions of that. These occur when one models the effect of two (or more) users trying to use two (or more) resources in parallel. The usual thought experiment relates to changing data base entries. The two users correspond to the two axes. Direction corresponds to their local times (non-synchronised in general) and the cross shaped region to inaccessible states of the system. You can imagine a situation a bit as follows.

The two users want to access two database records A and B. User one wants to edit A using information from B, whilst user two wants to edit B using information from A. When a user accesses a record that record is locked, so it then cannot be accessed by another user. (The reader is left to figure out the precise way in which this picture applies in that situation. A detailed, and more masterly, account can be found in several of the papers of Eric Goubault, for instance, see [2].) Any state in the cross shaped region corresponds to one or other record being locked. The directed paths in the space correspond to possible evolutions of the system. The 'system' usually starts at (0,0) and ends at the top right hand corner (1,1). Clearly the two paths, shown, give two directed homotopy classes that go from start to finish, *but* there are directed paths that start at (0,0) but can never arrive at (1,1). They correspond to user 1 locking A, and user 2 locking B, so neither can perform the other part of their task and deadlock results. Here the path would leave (0,0) heading approximately North East and would get trapped (near the corner that can be thought of as being at about (0.4,0.4)). Once the system gets into the zone bounded by the square (0.2, 0.2) to (0.4, 0.4), then it cannot get out again.

One problem for directed algebraic topology is to analyse such situations of shared resources to see how to avoid deadlock. To do this, one can define a *fundamental category* using d-homotopy classes of d-paths between points in the space, as we discussed above, and then attempt to extract the *essence* of what this is telling us, throwing away redundant information. The idea might be to identify points if they have similar futures and similar pasts. (It is quite instructive and fun to try this with the 'Swiss flag'.)

Some of the subtleties of this sort of problem are illustrated by another example (taken from the book).

Example 2. The example uses two directed spaces that are slightly dierent. (Both of these use a rectangle with order (x, y) $\leq$ (x', y') if and only if $|y' - y| \leq x' - x$, so the 'future cone' of any point is a cone symmetric about a horizontal line through the point and with edges at ± 45 degrees to that line and similarly for the 'past cone'.)

The two spaces are

and
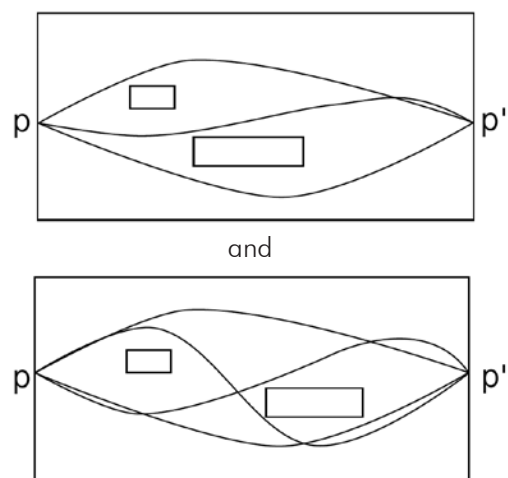
In both the space is the rectangle with two smaller rectangles removed. The position of the upper left small rectangle is the same in both, but that of the righthand lower rectangle is shifted slightly to the right in the second picture. The directed homotopy classes of d-paths from p to p' in the two cases are different. (Sample directed paths are shown.) The crucial point is that in the second case, there is such a class that was impossible in the first example, yet the spaces are homeomorphic, so classically would be expected to be 'the same'. The subtlety is in the order.

Turning now more directly to the book, it is organised in two parts and a moderately lengthy introduction. The two parts deal with *First order directed homotopy and homology* and *Higher directed homotopy theory* respectively. As is discussed in the Introduction, the approach taken to directed homotopy theory is based on an abstract directed cylinder functor, or dually on a directed path / cocylinder functor to provide a basis for the notion of (directed) homotopy. Viewing classical homotopy theory from that perspective enables the detailed analysis of constructions to see where a 'reversor' is used. At such points one can expect the directed theory to split. This sort of directed cylinder approach has the advantage of applying in many of the potential example categories. Being explicitly categorical from the start, its use makes for neat proofs of the main results, but, perhaps as a slight downside, the development can seem to be very abstract and quite slow. This abstraction is however illusory as when taken apart the constructions are very geometrically based.

The first chapter is called '*Directed structures and first order homotopy properties*'. This handles the transition from a classical undirected viewpoint to a 'directed' one. It introduces spaces with distinguished paths, recalls the definition of cubical set, adapting the classical approach to show the inherent 'directed' quality of these models. It then handles the theory for cylinder and path / cocylinder forms of directed homotopy. The gradation of the strength of axioms being used is sometimes a bit confusing, but each is carefully built on previous ones, so after a period of acclimatisation to the terminology, this works well as it emphasises what axiomatic system is needed for what aspect of the theory.

The second chapter '*Directed homology and non-commutative geometry*' looks at the natural directed homology of cubical sets, developing it and indicating its relation to non-commutative geometry (in the sense of Alain Connes, etc.)

The third chapter, '*Modelling the fundamental category*', was, to me the most fascinating. It attacks the problem that we hinted at earlier in this review, of finding a model of the fundamental category using small categorical models, but where, evidently, classical categorical notions have to be examined and sometimes adapted, refined, or discarded, to be replaced by ones that are more fully compatible with the intrinsic directed homotopy of small categories.

Going over into Part II, the three chapters are entitled '*Settings for higher order homotopy*', '*Categories of functors and algebras, relative settings*', and finally '*Elements of weighted algebraic topology*'. This review will concentrate mostly on this last chapter in this second part, as its form and content are somewhat easier to describe than the previous two, but also have more immediate intuitive impact. The idea here is again one that would seem to have great potential for applications. The earlier theory is extended so that to each path, there is a weight or cost attached, taking values in the extended interval $[0,\infty]$. The general aim is,

now, to measure the 'cost' of (possibly non-reversible) phenomena. The directed unit interval is replaced by a standard 'metric' interval, δI, with $\delta(x, y) = y - x$ if $x \leq y$ and $\delta(x, y) = \infty$ otherwise. The theory then is an adaptation of the earlier directed one and weighted versions of many of the constructions are examined. Spaces with weighted paths, analogous to and extending d-spaces, are introduced, and because of the categorical treatment used throughout the book, the generalisation is pretty 'painless' - yet feels about right for potential application.

The book ends with an Appendix '*Some points of category theory*', which discusses some of the ideas from category theory that are needed in the book, and sets up terminology and notation.

There is a good, quite extensive bibliography, a glossary of symbols and a reasonable index.

The book is very well written and interesting, and opens the way to an exploration of the more applied parts of this subject. If there is one criticism that this reviewer would make, it is that perhaps some slightly longer discussion of potential or actual applications of the theory might have provided a few more intuitive examples for the reader.

References

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[2] E. Goubault, *Some geometric perspectives in concurrency theory*, Homology, Homotopy and Applications 5 (2003), no. 2, 95–136.

[3] S. Krishnan, *A convenient category of locally preordered spaces*, Applied Categorical Structures 17 (2009), no. 5, 445–466..

*G*raham Wright Award for Distinguished Service
*G*Prix Graham-Wright pour service méritoire

2011

In 1995, the Society established this award to recognize individuals who have made sustained and significant contributions to the Canadian mathematical community and, in particular, to the Canadian Mathematical Society. The award was renamed in 2008 in recognition of Graham Wright's 30 years of service to the Society as the Executive Director and Secretary.

Nominations should include a reasonably detailed rationale and be submitted by **March 31, 2011**.

All documentation should be submitted electronically, preferably in PDF format, by the appropriate deadline, to gwaward@cms.math.ca.

En 1995, la Société mathématique du Canada a créé un prix pour récompenser les personnes qui contribuent de façon importante et soutenue à la communauté mathématique canadienne et, notamment, à la SMC. Ce prix était renommé à compter de 2008 en hommage de Graham Wright pour ses 30 ans de service comme directeur administratif et secrétaire de la SMC.

Pour les mises en candidature prière de présenter des dossiers avec une argumentation convaincante et de les faire parvenir, le **31 mars 2011** au plus tard.

Veuillez faire parvenir tous les documents par voie électronique, de préférence en format PDF, avant la date limite à prixgw@smc.math.ca.

An Episodic History of Mathematics Mathematical Culture through Problem Solving

By Steven G. Krantz
MAA Textbooks
Mathematical Association of America 2010
ISBN 978-0-88385-766-3

The purpose of this book is to acquaint the reader with mathematical language and mathematical life by means of a number of historically important vignettes which contain significant ideas of classical and modern mathematics. Each chapter includes a brief history of the mathematician involved before starting the discussion of the chapter's mathematics. The focus of the text is on getting involved with mathematical ideas and solving problems. The following list of chapter headings give an idea of the scope of the text: The ancient Greeks and the foundations of mathematics; Zeno's paradox and the concept of limit; The mystical mathematics of Hypatia; The Islamic world and the development of algebra; Cadano, Abel, Galois and the solving of equations; Descartes and the idea of coordinates; Fermat and the invention of differential calculus; The great Isaac Newton; Complex numbers and the fundamental theorem of algebra; Gauss, the prince of mathematics; Sophie Germain and Fermat's Last Problem; Cauchy and the foundations of analysis; Prime numbers; Dirichlet and how to count; Riemann and the geometry of surfaces; Cantor and orders of infinity; The number systems; Poincare, child phenomenon; Sonia Kovalevskaya and mechanics; Emmy Noether and algebra; Methods of proof; Alan Turing and cryptography.

Each chapter has an exercise set and the text itself is peppered with items labelled 'For you to try.' The book can be used for a course in mathematical culture (for non-majors), for an elementary course in the history of mathematics, and for a course in problem solving.

Inequalities, A Journey into Linear Analysis

By D. J. H. Garling
Cambridge University Press, 2007
ISBN 978-0-521-69973-0

Inequalities pervade a great deal of mathematical subjects. G. H. Hardy is reported to have said that 'all analysts spend half their time hunting through the literature for inequalities which they want to use but cannot prove.' This book provides a selection of inequalities used in linear analysis with detailed explanation of how they are used. It begins with Cauchy's inequality and ends with Grothendieck's inequality; in between one finds the Loomis-Whitney inequality, maximal inequalities, those of Hardy and of Hilbert, hypercontractive and logarithmic Sobolev inequalities. Among the topics discussed are: properties of function spaces, linear operators between them, special classes of operators, Lebesgue decomposition and density theorems, Hilbert transforms and other singular integral operators, martingale convergence

theorems, eigenvalue distributions, Lidskii's trace formula, Mercer's theorem and Littlewood's 4/3 theorem. Each chapter concludes with a collection of exercises.

Polyhedral and Semidefinite Programming Methods in Combinatorial Optimization

By Levent Tuncel
Fields Institute Monographs; 27
American Mathematical Society 2010
ISBN 978-0-8218-3352-0

Since the early 1960s, polyhedral methods have had a central role in both theory and practice of combinatorial optimization. Since the early 1990's, a new technique of semidefinite programming has been increasingly applied to some combinatorial optimization problems. The semidefinite programming problem is that of optimizing a linear function of matrix variables, subject to finitely many linear inequalities, and a positive semidefiniteness condition on some of the matrix variables. On certain problems, such as maximum cut, maximum satisfiability, maximum stable set and geometric representations of graphs, semidefinite programming techniques yield important, new results. Based on a series of ten lectures given at the Fields Institute in Fall 1999, this monograph provides the necessary background to work semidefinite optimization techniques, usually by drawing parallels to the development of polyhedral techniques and with a special focus on combinatorial optimization, graph theory and lift-and-project methods.

The monograph presupposes a solid mathematical background at the undergraduate level with some exposure to linear optimization. Some familiarity with computational complexity theory and analysis of algorithms would be helpful. The book contains open problems, new directions and new connections to other areas in mathematical sciences.

Spectral Methods for Time-Dependent Problems

By Judith V. Grabiner, MAA Spectrum,
Mathematical Association of America, Washington,DC,
287 pp, $62.95 (US) ISBN 978-0-88385-572-0.

At the heart of spectral methods is the fact that any nice enough function $u(x)$ can be expressed as the sum of expansions in terms of global basis functions. This book collects all ingredients necessary for the understanding of spectral methods for time-dependent problems, and, in particular, hyperbolic partial differential equations. The first eight chapters comprise a complete first course in spectral methods, covering motivation, derivation, approximation theory and stability analysis of both Fourier and polynomial spectral methods. Advanced topics are treated in the last four chapters. The book can be used as a text for graduate courses or for self-study.

CALL FOR NOMINATIONS / APPEL DE MISES EN CANDIDATURE

Prix Coxeter-James Prize Lectureship — 2012

The Coxeter-James Prize Lectureship recognizes young mathematicians who have made outstanding contributions to mathematical research. The recipient shall be a member of the Canadian mathematical community. Nominations may be made up to ten years from the candidate's Ph.D: researchers having their PhD degrees conferred in 2001 or later will be eligible for nomination in 2011 for the 2012 prize. A nomination can be updated and will remain active for a second year unless the original nomination is made in the tenth year from the candidate's Ph.D. The prize lecture will be given at the 2012 CMS Winter Meeting.

Le prix Coxeter-James rend hommage aux jeunes mathématiciens qui se sont distingués par l'excellence de leur contribution à la recherche mathématique. Cette personne doit être membre de la communauté mathématique canadienne. Les candidats sont admissibles jusqu'à dix ans après l'obtention de leur doctorat : ceux qui ont obtenu leur doctorat en 2001 ou après seront admissibles en 2011 pour le prix 2012. Toute mise en candidature est modifiable et demeurera active l'année suivante, à moins que la mise en candidature originale ait été faite la 10e année suivant l'obtention du doctorat. La personne choisie prononcera sa conférence à la Réunion d'hiver SMC 2012.

Prix Jeffery-Williams Prize Lectureship — 2012

The Jeffery-Williams Prize Lectureship recognizes mathematicians who have made outstanding contributions to mathematical research. The recipient shall be a member of the Canadian mathematical community. A nomination can be updated and will remain active for three years. The prize lecture will be given at the 2012 CMS Summer Meeting.

Le prix Jeffery-Williams rend hommage aux mathématiciens ayant fait une contribution exceptionnelle à la recherche mathématique. Cette personne doit être membre de la communauté mathématique canadienne. Toute mise en candidature est modifiable et demeurera active pendant trois ans. La personne choisie prononcera sa conférence à la Réunion d'été SMC 2012.

Prix Krieger-Nelson Prize Lectureship — 2012

The Krieger-Nelson Prize Lectureship recognizes outstanding research by a female mathematician. The recipient shall be a member of the Canadian mathematical community. A nomination can be updated and will remain active for two years. The prize lecture will be given at the 2012 CMS Summer Meeting.

Le prix Krieger-Nelson rend hommage aux mathématiciennes qui se sont distinguées par l'excellence de leur contribution à la recherche mathématique. La lauréate doit être membre de la communauté mathématique canadienne. Toute mise en candidature est modifiable et demeurera active pendant deux ans. La lauréate prononcera sa conférence à la Réunion d'été SMC 2012.

The deadline for nominations is June 30, 2011. La date limite de mises en candidature est le 30 juin 2011.

Nominators should ask at least three referees to submit letters directly to the CMS by September 30, 2011. Some arms-length referees are strongly encouraged. Nomination letters should list the chosen referees, and should include a recent curriculum vitae for the nominee, if available. Nominations and reference letters should be submitted electronically, preferably in PDF format, by the appropriate deadline, to the corresponding email address:

Les proposants doivent faire parvenir trois lettres de référence à la SMC au plus tard le 30 septembre 2011. Nous vous incitons fortement à fournir des références indépendantes. Le dossier de candidature doit comprendre le nom des personnes données à titre de référence ainsi qu'un curriculum vitae récent du candidat ou de la candidate, dans la mesure du possible. Veuillez faire parvenir les mises en candidature et lettres de référence par voie électronique, de préférence en format PDF, avant la date limite, à l'adresse électronique correspondante:

Coxeter-James: cjprize@cms.math.ca   Coxeter-James: prixcj@smc.math.ca
Jeffery-Williams: jwprize@cms.math.ca   Jeffery-Williams: prixjw@smc.math.ca
Krieger-Nelson: knprize@cms.math.ca   Krieger-Nelson: prixkn@smc.math.ca

This issue shines the light on another form of outreach in the educational community. Specifically, Lisa Lunney Borden and David Wagner share an example of deepening the connection between mathematical ideas and the lived experiences in communities of Mi'kmaw and Maliseet children. The *Show Me Your Math* initiative began in Nova Scotia in 2006. The article provides insight into the field of ethnomathematics through a contextually alive lens.

One of the roles of Education Notes is to bring greater awareness to mathematical initiatives related to education, particularly within Canada. Last month there was an article focused on The Fields Institute. The feature article in this issue is followed by an introductory piece on the Atlantic Association for Research in the Mathematical Sciences (AARMS). We welcome contributions from organizations, institutes, or local initiatives that bring together mathematics and education.

Show Me Your Math

Lisa Lunney Borden (St. Francis Xavier University)
David Wagner (University of New Brunswick)

Since the spring of 2006, over a thousand Mi'kmaw and Maliseet children have participated in the annual Show Me Your Math (SMYM) event to show others the mathematics used in their communities. The initiative is based in Nova Scotia, though has extended to New Brunswick, Quebec, and Newfoundland and Labrador. Students from kindergarten to grade 12 have participated. In their ethnomathematical investigations they identified mathematics at work in current and traditional community practices.

What is SMYM?

Participating students responded to video instructions, which can be viewed at http://schools.fnhelp.com/math/showmeyourmath/VideoIntroduction.html. In the video, a Mi'kmaw elder raises the question: What is mathematics? Surely mathematics is not limited to what is done in school math classes, or to what mathematicians may choose to do. He gives suggestions about where to find mathematics and then invites the viewer to show off the mathematics in his/her community: "Mathematics is counting, measuring, and locating. When you *design, explain* or *play* with *counting, measuring* or *locating*, you are doing math. If you think of mathematics in this way, you might begin to see it all around you." (He is drawing on the list of six human activities that Alan Bishop identified as being potentially mathematical, italicized in the preceding quotation.)

In response to the video, and urged by their teachers, school children interviewed elders, experts in crafts and others to explore mathematics that has been used in their communities' traditional practices and also more current mathematics in their communities. In some schools, elders and other experts were invited by teachers into classrooms to work with a whole class on a project (especially for the younger children). In other schools, students interacted with community members outside of school to complete projects independently or in small groups. Students published their work on the SMYM internet site—http://schools.fnhelp.com/math/showmeyourmath/studentwork.html. Many students have also presented their work to the region's communities in math fairs.

We designed the SMYM event with a group of mathematics teachers and elders from Mi'kmaw communities in Nova Scotia, who continue to make the necessary arrangements annually. To be responsive to cultural values, we wanted to structure the event so that students would learn in relationship with community members, family members, elders, and peers. This kind of learning promotes respect for community knowledge. It helps students see that mathematical reasoning is a part of their cultural identity. It also positions the community as a source of mathematical knowledge, thus dispelling the myth that mathematical knowledge comes from teachers and textbooks.

Constructing the 8-Point Star

Student interests are often the focus of mathematics learning that occurs as a part of SMYM. "The 8-Point star" is a well-known design amongst Mi'kmaw people (see at right). The shape is often coloured using the four traditional colours of red, black, white and yellow, each having spiritual significance. This star shape has been the subject of several SMYM investigations.
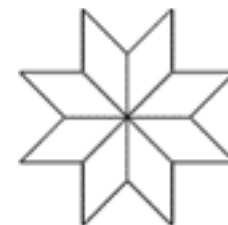
One high school student chose to explore aspects of paper folding and cutting that would enable her to quickly create an 8-point star. Through a series of explorations she developed an approach that involved three folds and one cut, creating a perfect 8-Point star. (You may want to try your hand at this task.) During a math fair she shared her stories of discovery with those who visited her display and also invited visitors to try it out for themselves with her guidance. The photo below shows her demonstrating her method at the math fair.
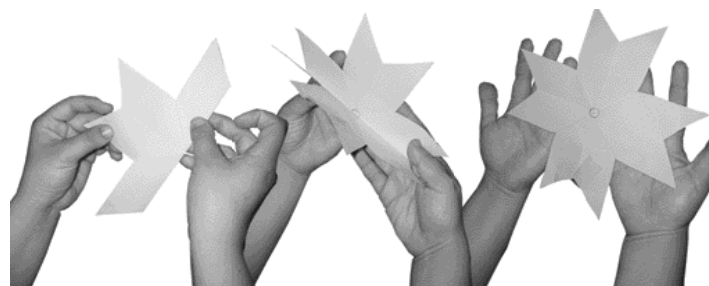
Spiritual Significance

A grade 4 boy made a drum under the tutelage of an elder invited into class by his teacher. (Each student in the class made a drum.) At a math fair, his off-the-cuff account of this experience demonstrates that there are often deeper meanings that accompany practices (mathematical or not):

"This one that I made, it has twelve sides so that's a dodecagon, right. While I was making it we took time because usually people take twelve days but we took an hour and a half. (*He turns the drum over to show the back*). So we used, um, I think it was red deer or red moose, I don't know actually but right here it tells you how to make it. (*He leans forward to point out the sheet of instructions posted in front of their drum display.*) We put a sponge in the drumsticks. We took our time with these. (*He pauses for a bit hitting the drum a couple times with his drumstick, then turns the drum over again revealing the back*). The turtle represents the day. The twelve sides is like twelve in the head. That's like an Indian drum, so if you hit at the turtle (*He turns the drum over and hits the drum at the turtle [12:00] position*) that's, um, you're going to the spirit world. If you hit over here you're praying for the boys (*He moves the drumstick counter-clockwise to the west position*), down here (*south position*) you are praying for the girls and over here (*the east position*) is for the ones that are coming."

This boy recognized mathematical aspects of his work (e.g., counting, the dodecagonal prism used for the frame) but did not seem to notice how fluent he had become with locating points on a plane, and the significance of the turtle-marking on one side as an arbitrary origin for this locating. We think this experience will make graphing easier for him in the future.

Challenges and Opportunities

While SMYM has brought about positive impacts on students and schools, challenges remain. Mathematics curriculum is prescribed and teachers are busy. It would be great if mathematics teachers could connect their teaching of new concepts to SMYM projects their students have done, but it would take considerable time to identify the potential connections for each SMYM project. One high school teacher has made use of a Grade 11 independent study requirement as a way of engaging all students in the SMYM investigations and giving them credit for their work. Unfortunately, not all mathematics programs have outcomes that allow for such easy integration of the projects. We hope to facilitate greater connections between projects and outcomes by identifying common themes in student projects and connecting them to mathematics curriculum at every level.

We believe that the structure of SMYM is something that may be of benefit to any community that seeks to revitalize its children's interest in mathematics and to honour community practices in school. Not only Aboriginal communities would have these goals. Aspects of the SMYM event were structured to follow existing practices in the involved communities—for example, the use of the internet to share projects among communities that are relatively remote from each other. This kind of publication may not be comfortable for other communities. It is important for anyone wishing to develop their own SMYM event to be diligent about honouring local values and practices.

We think that it is important that it was community members in the video who invited students to do their ethnomathematical investigation. This positions the community as audience. Typically, school work is done for the teacher (which is odd because the teacher already knows the material). When students address their community, they more naturally think about how mathematical decisions address community problems/issues. This is why we decided on using a video for instructions.

There is no Mi'kmaw word for *mathematics*, so it may seem strange to identify mathematics in Mi'kmaw communities. In communities that borrow or import the word mathematics and associated ideas, the value of a practice is determined on the basis of it addressing community needs. So while there may be no word for mathematics, there are many Mi'kmaw words for valued community practices that could be seen as mathematical. This reminds us that the word mathematics is also imported into English. The intersection of mathematical practices and 'non-mathematical' practices is worth attention in any culture or sub-culture. Furthermore, exploration of this intersection may enable all students to better understand and value the role of mathematics in their own cultural or community context.

AARMS: What is it?
by David Langstroth

The Atlantic Association for Research in the Mathematical Sciences (AARMS) was founded in March, 1996 at a time when the National Network for Research in the Mathematical Sciences was being discussed and planned. AARMS exists to encourage and advance research in mathematics, statistics, computer science, and mathematical sciences, in the Atlantic region. In addition, AARMS acts as a regional voice in discussions of the mathematical sciences on a national level. Since its inception, AARMS has played an important role in research activities in the Atlantic region, sponsoring or co-sponsoring numerous meetings and workshops, providing partial funding for postdoctoral fellowships, sponsoring a Distinguished Lecturer series, supporting outreach initiatives and running an annual summer school delivering graduate level courses to students from around the world.

AARMS is funded by the Mathematical Institutes (CRM, Fields and PIMS), by the three founding universities (Dalhousie, Memorial and UNB) and by the smaller universities in the Atlantic Region. It is also supported by generous grants from the provinces of New Brunswick and Nova Scotia. AARMS is operated on a day to day basis by an Executive Committee led by the Director, Viqar Husain (UNB). A Board of Directors oversees the organization and a Scientific Review Panel assesses proposals and offers scientific advice.

The 2011 AARMS Summer School will take place at Memorial University in Saint John's. Courses will be offered in Analysis and Geometry of Partial Differential Equations, Harmonic Analysis, Numerical Solution to Partial Differential Equations and Mathematical Biology. Further information about this program for graduate students and upper-level undergraduates can be found at www.aarms.math.ca/summer/ .

Workshop and Conference Funding can be obtained by submitting a proposal to our online system in time for one of our three deadlines each year: January 15, May 15, September 15. More details can be found at www.aarms.math.ca/events/.

Once a year AARMS also operates a competition for our postdoctoral fellowship support program. Starting in 2011 AARMS will also be funding a new program to support Collaborative Research Groups.

Outreach activities supported by AARMS have included Math Camps, competitions, teacher support, seminars and workshops. Please see our outreach page: www.aarms.math.ca/outreach/ . Recently AARMS funded a pilot project in New Brunswick entitled *Enhancing Appreciation of Mathematics through Intentional Community Outreach*. The project led by John Grant McLoughlin has featured recreational mathematics including events in public library and school settings. The project will be shared in a future issue of **Education Notes**.

For further information about AARMS please contact David Langstroth, AARMS Executive Administrator (dll@cs.dal.ca).

FROM THE VICE-PRESIDENT'S DESK *continued*

One particularly attractive family of such groups arises from elliptic curves E over a finite field F. The group in question is the F-valued points on E and under some hypotheses, it can be shown that this group is cyclic. A question that arose is whether there is any difference in the difficulty of the discrete logarithm problem if the field F is of order 2n where n is composite. This was particularly relevant, as an industry standard had adopted a curve over a field with n=155. As proved in a paper of Jacobson, Menezes and Stein[1], the discrete logarithm problem on this curve can be attacked by applying a functor of Weil (restriction of scalars) to descend the curve to an Abelian variety defined over a smaller field, recognizing this Abelian variety as the Jacobian of a hyperelliptic curve, and then applying an index calculus attack. This general approach to attacking the discrete logarithm problem had been proposed earlier by Frey. What is interesting about it is the use of algebraic geometry tools that had been developed decades earlier with no idea of their possible applicability in encryption.

Another such story is described in the fascinating book *The Shape of Inner Space*. Shing-Tung Yau, along with coauthor Steve Nadis, describes the exciting development of the theory of what are now called Calabi-Yau manifolds and their relationship to the structure of the universe. They write "There certainly is no shortage of abstract ideas that came to mathematicians seemingly out of thin air and that were later found to describe natural phenomenon."[2]

Calabi-Yau manifolds were studied purely as mathematical objects with a lot of beautiful structure. Physicists searching for a mathematical structure that could model the symmetries and other constraints required of a string theoretic model of the universe found what they were looking for in six dimensional Calabi-Yau manifolds and this was captured in a groundbreaking paper of Candelas, Horowitz, Strominger and Witten[3]. None of this had been anticipated in the work of Calabi or Yau, and Calabi later remarked that he was just doing geometry and had not expected any physical meaning to the work. Moreover, all of this has stimulated new interactions between mathematicians and physicists.

Though it may be an overstatement to say that the chasm between pure and applied is narrowing, it is certainly not an overstatement to say that there are many new bridges connecting these. There are numerous examples of mathematics developed in the context of 'curiosity driven research', investigated solely for its intrinsic beauty which in course of time, has been found to play a crucial role in an applied context. There are also new problems that are either motivated by or arising from applications and which will require the participation of pure mathematicians if they are to be resolved. A healthy research enterprise must recognize, value and encourage the contributions of both of these aspects.

1 M. Jacobson, A. Menezes, A. Stein, Solving elliptic curve discrete logarithm problems using Weil descent, J. Ramanujan Math. Soc., 16(2001), 231-260.

2 S.-T. Yau and S. Nadis, The Shape of Inner Space, p.290, Basic Books, New York, 2010.

3 P. Candelas, G. Horowitz, A. Strominger, E. Witten, Vacuum configurations for superstrings, Nuclear Physics B, 258(1985), 46-74.

La recherche pure et appliquée en mathématique

De nos jours, nous sommes habitués à classifier la recherche mathématique et les mathématiciens dans diverses catégories : pure (ou fondamentale), appliquée, industrielle, etc. Toutefois, force est d'admettre que ces classifications n'étaient pas monnaie courante dans le passé. Des scientifiques comme Aryabhatta, qui s'intéressait surtout à l'astronomie, travaillait également sur des solutions appelées aujourd'hui les équations diophantiennes linéaires. Gauss s'était lui aussi penché sur de nombreux problèmes, dont la réciprocité quadratique, les racines primitives et la théorie de la probabilité, ainsi que la force électrique et le mouvement des planètes. En fait, pendant plusieurs décennies, Gauss était professeur d'astronomie à Göttingen. Il existe beaucoup d'autres exemples qui montrent comment la compartimentalisation de l'activité mathématique était très rare à l'ère classique.

Les travaux multidisciplinaires ne sont pas tout à fait absents de nos jours. Parmi les exemples notables, mentionnons Mumford, un géomètre algébrique qui travaille sur le problème de la reconnaissance faciale; Tao qui travaille dans de nombreux domaines, notamment la théorie des nombres et la télédétection; et Dyson, un physicien qui a fait des contributions à la théorie des nombres. Cependant, de façon générale, nous avons tendance à adopter une approche assez compartimentalisée et rigide dans les problèmes que nous choisissons d'étudier, d'où la classification continue de notre travail (et de nous-mêmes) dans les catégories pure ou appliquée.

Cette rigidité tient, en partie, aux progrès scientifiques réalisés dans chaque discipline. Il est déjà assez difficile de rester à l'affût des nouveautés dans notre propre domaine de spécialité, si bien que nous estimons ne pas avoir le luxe de nous aventurer dans d'autres domaines. En raison du volume de recherches qui existent déjà, il y a lieu de douter de notre capacité de contribuer de façon valable à un champ d'étude qui nous est relativement nouveau.

La raison est attribuable, en partie, aux exigences des organismes de financement. En effet, les demandes de financement doivent être assignées à des comités ou des sous-comités ayant une expertise dans un domaine précis, et on pourrait hésiter à présenter une proposition que le comité juge difficile à classifier. C'est peut-être aussi lié à la croissance générale de la collectivité mondiale des mathématiciens. Il semble que plus la taille augmente, plus un besoin de classification et de compartimentalisation se fait sentir, et cela s'applique non seulement à la recherche mais aussi à l'enseignement.

Toutefois, de nouvelles pistes de recherche ouvrent la voie à des problèmes qui nécessitent les efforts concertés des mathématiciens, aussi bien ceux qui font de la recherche pure que ceux qui font de la recherche appliquée, ainsi que des scientifiques d'autres disciplines. Ces nouvelles pistes créent des domaines de recherche que nous ne pouvons clairement pas classifiés dans les catégories pure ou appliquée.

Le premier domaine qui vient à l'esprit regroupe les problèmes découlant de la technologie de l'information. Avec l'introduction des courbes elliptiques comme source d'algorithmes de partage de clé cryptographique, le problème du logarithme discret revêt une grande importance pratique. Ce problème peut s'appliquer à tout groupe abélien cyclique G pour lequel nous avons un générateur g (par exemple). Tout autre élément h de G est une puissance de g, et le problème du logarithme discret consiste à déterminer cette puissance de façon algorithmique. Nous constatons qu'il ne s'agit pas vraiment d'un problème mathématique, mais d'un problème informatique qui dépend entièrement de la manière dont le groupe est présenté.

Une famille particulièrement attrayante de ce genre de groupes découle des courbes elliptiques E sur un champ fini F. Le groupe en question est composé des points valués F sur E et, selon certaines hypothèses, on peut montrer que ce groupe est cyclique. Une des questions qui se posent est de savoir s'il y a une différence dans la difficulté du problème du logarithme discret si le champ F est de l'ordre de 2n, où n est un composite. Cette question est particulièrement pertinente, puisque la norme industrielle a adopté une courbe sur un champ où n=155. Ainsi qu'il a été prouvé dans un article de Jacobson, Menezes et Stein[1], le logarithme discret sur cette courbe peut être calculé en appliquant un élément logique de Weil (restriction des scalaires) pour descendre la courbe à une variété abélienne définie sur un champ plus petit, cette variété abélienne étant reconnue comme la forme jacobienne d'une courbe hyperelliptique, pour ensuite appliquer un « index calculus attack ». Cette approche générale avait été proposée auparavant par Frey. L'aspect intéressant est l'utilisation d'outils de géométrie algébrique élaborés il y a des décennies, sans aucune idée de leur applicabilité possible à la cryptographie.

Un autre exemple est décrit dans l'ouvrage fascinant intitulé The Shape of Inner Space. Les auteurs, Shing-Tung Yau et Steve Nadis, décrivent la création fort intéressante de la théorie connue maintenant sous le nom d'ensembles Calabi-Yau et sa relation avec la structure de l'univers. Selon les auteurs, il existe une foule d'exemples qui montrent comme les mathématiciens en sont venus à des idées abstraites qui sortaient apparemment de nulle part, mais qui ont servi plus tard à décrire des phénomènes naturels.[2]

Les ensembles Calabi-Yau ont été étudiés dans le contexte de la recherche pure en tant qu'objets mathématiques caractérisés par la beauté de leur structure. À la recherche d'une structure mathématique pouvant modéliser les symétries et autres contraintes requises selon un modèle théorique en chaînes de l'univers, les physiciens ont découvert leur réponse dans les ensembles Calabi-Yau à six dimensions. Les résultats ont été présentés dans un article révolutionnaire de Candelas, Horowitz, Strominger et Witten[3]. Pourtant, rien de tel n'avait été prévu dans les travaux de Calabi ni de Yau. D'ailleurs, Calabi a ultérieurement indiqué qu'il ne faisait que de la géométrie et qu'il ne s'attendait pas à ce que son travail ait une signification en physique. Ainsi, ce travail a stimulé de nouvelles interactions entre les mathématiciens et les physiciens.

CMS Election 2011

This year the CMS will be electing fifteen (15) officer and director positions:

President-Elect;
Vice-President: Atlantic;
Vice-President: Quebec;
Vice-President: Ontario;
Vice-President: Western Provinces and Territories;
Atlantic: 2 members to be elected;
Quebec: 2 members to be elected;
Ontario: 3 members to be elected:
Western Provinces and Territories: 4 members to be elected; and
At Large: 1 member to be elected.

For 2011, the CMS will hold the election electronically. Election and voting information is posted on the CMS web site at: http://cms.math.ca/Elections/2011/.

Election results will be announced at the CMS Annual General Meeting (AGM) in Edmonton this June.

James Lewis
Chair, CMS Nominations Committee

Élection de la SMC 2011

Cette année, la SMC éliront quinze (15) postes de dirigeants et administrateurs :

Président-élu;
Vice-président : provinces de l'Atlantique;
Vice-président : Québec;
Vice-président : Ontario;
Vice-président : provinces de l'Ouest et les Territoires;
Atlantique : 2 membres doivent être élus;
Québec : 2 membres doivent être élus;
Ontario : 3 membres doivent être élus;
Provinces de l'Ouest et les Territoires : 4 membres doivent être élus; et
En général : 1 membre qui sera élu.

Pour 2011, la SMC tiendra l'élection par voie électronique. Renseignements électorale et du vote est publié sur le site web de la SMC à: http://cms.math.ca/Elections/2011/f.

Les résultats des élections seront annoncés à l'assemblée générale annuelle (AGA) de la SMC à Edmonton en juin.

James Lewis
Président du Comité de mise en candidature

December 10 - 12 décembre, Toronto (Ontario)

Hosts: Ryerson University, York University (Toronto, Ontario)

We welcome and invite proposals for sessions for this meeting in Toronto, Ontario (December 10-12, 2011); in particular, we encourage submissions from Ontario universities. Proposals should include a brief description of the focus and purpose of the session, the expected number of speakers, as well as the organizer's name, complete address, telephone number and e-mail address. All sessions will be advertised in the CMS Notes, on the web site and in the AMS Notices. Speakers will be requested to submit abstracts, which will be published on the web site and in the meeting program. Those wishing to organize a session should send a proposal to the Meeting Directors by the deadline below.

Deadline: April 30, 2011

Hôtes : Universités Ryerson et York (Toronto, Ontario)

Nous vous invitons à proposer des sessions pour la Réunion qui se tiendra à Toronto (Ontario) du 10 au 12 décembre 2011; nous incitons particulièrement les universités de l'Ontario à faire des propositions. Votre proposition doit inclure une brève description de l'orientation et des objectifs de la session, le nombre de conférenciers prévues, ainsi que le nom, l'adresse complète, le numéro de téléphone et l'adresse courriel. Toutes les sessions seront annoncées dans les Notes SMC, sur le site web et dans le AMS Notices. Les conférenciers devront présenter un résumé qui sera publié sur le site web et dans le programme de la réunion. Toute personne qui souhaiterait organiser une session est priée de faire parvenir une proposition aux directeurs de la Réunion avant la date indiquée ci-dessous.

Date limite : 30 avril 2011

Scientific Directors / Directeurs scientifiques :

Anthony Bonato
abonato@ryerson.ca, T: 416-979-5000 ext. 4912

Juris Steprans
steprans@yorku.ca, T: 416-736-5250

The following sessions have been confirmed for this conference:
Les sessions suivantes ont été confirmées :

Algebraic Combinatorics
Combinatoire algébrique
Org: Nantel Bergeron (York), Mike Zabrocki (York)

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), Pawel Prałat (West Virginia)

Discrete Geometry
Géométrie discrete
Org: Walter Whiteley (York)

Designs, Factorizations and Coverings
Designs, factorisations et Revêtements
Org: Peter Danziger (Ryerson), Lucia Moura (Ottawa), Brett Stevens (Carleton)

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

Fluid Dynamics
Dynamique des fluides
Org: Serge D'Alessio (Waterloo), Katrin Rohlf, J.P. Pascal (Ryerson University)

Histoire et philosophie des mathématiques
History and Philosophy of Mathematics
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)

Operator Algebras
Algèbres d'opérateurs
Org: 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)

Set Theory
Théorie des ensembles
Org: Ilijas Farah (York)

June 3-5 juin 2011
University of Alberta, Edmonton

Prizes | Prix

Krieger-Nelson Prize | Prix Krieger-Nelson
Rachel Kuske (UBC)

Jeffery-Williams Prize | Prix Jeffery-Williams
Kai Behrend (UBC)

Excellence in Teaching Award
Prix d'excellence en enseignement
Yvan Saint-Aubin (Montréal)

Public Lecture | Conférence publique

Gerda de Vries (Alberta)

Sessions

Aperiodic Order | Ordre apériodique
Org: Elaine Beltaos, Nicolae Strungaru (Grant MacEwan)

Applicable Harmonic Analysis and Approximation Theory | Analyse harmonique appliquée et théorie d'approximation
Org: Bin Han (Alberta)

Asymptotic Geometric Analysis and Convex Geometry Analyse géométrique asymptotique et géométrie convexe
Org: Alexander Litvak, Nicole Tomczak-Jaegermann, Vlad Yaskin (Alberta)

Banach Spaces and Operators Between Them Espaces de Banach et des opérateurs entre eux
Org: Edward Odell (Texas), Thomas Schlumprecht (Texas A&M), Vladimir Troitsky (Alberta)

Combinatorial Matrix Theory Théorie combinatoire des matrices
Org: Shaun Fallat (Regina), Kevin N. Vander Meulen (Redeemer College)

Computational Toric Geometry Géométrie torique computationelle
Org: Charles Doran (Alberta), Andrey Novoseltsev (Alberta), William Stein (Washington)

Dynamical Systems | Systèmes dynamiques
Org: Arno Berger, Hao Wang (Alberta)

Geometry and Physics | Géométrie et physique
Org: Charles Doran, Vincent Bouchard (Alberta)

Plenary Speakers | Conférences plénières

Leah Edelstein-Keshet (UBC)
Olga Holtz (UC Berkeley; TU Berlin)
François Lalonde (Montréal)
Bjorn Poonen (MIT)
Roman Vershynin (Michigan)

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Hassan Safouhi (Alberta)
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Homotopy and Categories | Homotopie et catégories
Org: Pieter Hofstra (Ottawa), George Peschke (Alberta), Dorette Pronk (Dalhousie)

L-Functions and Number Theory Functions L et théorie des nombres
Org: Clifton Cunningham, Matthew Greenberg (Calgary)

Lie Theory | Théorie de Lie
Org: Terry Gannon, Nicolas Guay (Alberta)

Mathematical Finance | Finance mathématique
Org: Tahir Choulli, Alexander Melnikov (Alberta)

Mathematics Education | Éducation mathématique
Org: Tiina Hohn (Grant MacEwan)

New Mathematical Tools for the Modeling of Cellular Processes Nouveaux outils mathématiques pour modélisation des processus cellulaires
Org: Thomas Hillen (Alberta)

Operator Algebras | Algèbres d'opérateurs
Org: Berndt Brenken (Calgary), George Elliott (Toronto), Cristian Ivanescu (Edmonton)

Turbulent Flow and Its Mathematical Foundations Turbulence et ses fondations mathématiques
Org: John C. Bowman, Xinwei Yu (Alberta)

Contributed Papers | Communications libres
Org: Adriana Dawes (Alberta)

AARMS-CMS Graduate Student Poster Session Présentations par affiches pour étudiants
Org: Thomas Hillen (Alberta)

RÉUNION D'ÉTÉ SMC 2011 CMS SUMMER MEETING

The Canadian Mathematical Society (CMS) and the University of Alberta invite the mathematical community to the 2011 CMS Summer Meeting.

All scientific talks and social events will take place at the University of Alberta. Registration, exhibits and coffee breaks are located in the Centennial Centre for Interdisciplinary Science (CCIS).

2011 marks the 100th anniversary of the first undergraduate degree awarded at the University of Alberta and the 50th anniversary of the first doctoral degree awarded in the Department of Mathematical and Statistical Sciences.

Several events are planned for students: A student social, a panel discussion and the AARMS-CMS poster session.

Presentations:
A Women Mathematicians' Lunch and Panel Discussion on Mentoring is taking place on Friday June 3, 12:30 - 2:00 pm.

Early Bird Registration – Deadline: March 31
To qualify for the discounted Early Bird registration fee, the registration form and payment have to be received by the deadline.

Accommodation – Deadline: May 2
We have secured discounted rates at the University Residences and the Campus Tower Hotel; the rates may no longer be available after the deadline.

Travel - Air Canada is the Official Canadian Airline for this event, offering special discounts to delegates attending the CMS Summer Meeting for travel to and from Edmonton between May 26 and June 12. The Promotion Code X4QFWPK1 has to be entered during the booking.

Student Subsidies - We encourage the participation of students at the Meeting. With the support of CRM, the Fields Institute, MITACS and PIMS, grants are available to partially fund the travel and accommodation costs for bona fide graduate students at a Canadian or other university. Preference is given to Canadian students. To apply for this funding, applicants should submit a letter written by their supervisor or departmental graduate advisor, providing the following: name of student, area of study and level, how the student will benefit from the meeting, whether or not the student be speaking, and what support is available from other sources.

Sponsors: University of Alberta, AARMS, CRM, Fields, MITACS and PIMS

We look forward to welcoming you in Edmonton!

Du 3 au 5 juin 2011
Université de l'Alberta (Edmonton, Alberta)
www.smc.math.ca

La Société mathématique du Canada (SMC) et l'Université de l'Alberta invitent la communauté mathématique à la Réunion d'été 2011 de la SMC.

Toutes les communications scientifiques et activités sociales se dérouleront à l'Université de l'Alberta. L'inscription, le salon des exposants et les pauses-santé se tiendront au Centennial Centre for Interdisciplinary Science (CCIS).

L'année 2011 marque le 100e anniversaire du premier diplôme de premier cycle décerné par l'Université de l'Alberta et le 50e anniversaire du premier doctorat accordé au Département de sciences mathématiques et statistiques.

Plusieurs activités sont prévues pour les étudiants : activité sociale, discussion en groupe et séance de présentation par affiche AARMS-SMC.

Présentations :
Un lunch des mathématiciennes et panel sur le mentorat se tiendra le vendredi 3 juin, 12 h 30 - 14 h.

Préinscription – Date limite : 31 mars
Pour avoir droit au tarif réduit de préinscription, le formulaire d'inscription accompagné du paiement doivent nous parvenir au plus tard à la date limite.

Hébergement – Date limite : 2 mai
Nous avons négocié des chambres à tarif réduit aux résidences universitaires et à l'hôtel Campus Tower; il se peut que le tarif réduit ne soit plus offert après la date limite.

Déplacement - Air Canada est le transporteur aérien officiel canadien de cette rencontre. Il offre une réduction aux personnes qui assisteront à la Réunion d'été de la SMC et voyageront à destination ou en provenance de Edmonton entre le 26 mai et le 12 juin. Il faut entrer le Code de promotion X4QFWPK1 au moment de la réservation.

Aide financière - Nous encourageons la participation des étudiants à la Réunion. Grâce au soutien financier du CRM, de l'Institut Fields, du Réseau MITACS et du PIMS, les étudiants diplômés du Canada ou de l'étranger peuvent se faire rembourser une partie de leurs frais de déplacement et de séjour. La préférence est toutefois accordée aux étudiants canadiens. Toute demande de financement doit être accompagnée d'une lettre du superviseur de l'étudiant ou de la personne responsable des études supérieures de son département, dans laquelle il ou elle indiquera le nom de l'étudiant, son domaine et son niveau d'études, en quoi la Réunion sera profitable à l'étudiant, si l'étudiant présentera une communication et si l'étudiant a accès à d'autres sources de financement.

Commandites : Universitée d l'Alberta, AARMS, CRM, Fields, MITACS et PIMS

Au plaisir de vous accueillir à Edmonton!

MATHEMATICS OF PLANET EARTH 2013

Under the acronym MPE2013, the project is to hold a special year under the theme Mathematics of Planet Earth in 2013: www.mpe2013.org

During this year, scientific activities will take place, organized by research institutes in mathematical sciences, learned societies and the mathematical community. In parallel, there will be activities for the public, the media and the schools.

An invitation to participate is sent to the world mathematical community and a special invitation is sent to the CMS members and the Canadian mathematical community

The theme is interpreted in a very broad sense. Earth is a planet with dynamic processes in the mantle, oceans and atmosphere creating climate, causing natural disasters, and influencing fundamental aspects of life and life-supporting systems. In addition to these natural processes, humans have developed systems of great complexity, including economic and financial systems; the world-wide web; frameworks for resource management, transportation and health-care delivery; and sophisticated social organizations. Human activity has increased to the point where it influences the global climate, impacts the ability of the planet to feed itself and threatens the stability of these systems. Issues such as climate change, sustainability, man-made disasters, control of diseases and epidemics, management of resources, and global integration have come to the fore. Mathematics is poised to play an essential role in the study of planetary issues, both as a fundamental discipline, and as an essential component of multidisciplinary research.

Mathematics of Planet Earth 2013 will focus mathematical research in these fields, provide a platform to showcase the essential relevance of mathematics to planetary problems, coalesce activities currently dispersed among institutions, and create a context for mathematical and interdisciplinary developments that will be necessary in order to address a myriad of issues and meet the global challenges in the future.

The activities will take place everywhere on the planet. The scientific activities will include thematic terms or semesters on subthemes related to the main theme, workshops, collaborative research groups, summer schools and special issues of scientific journals. Several learned societies will hold a meeting on the theme or will publish related articles in their Newsletter. Collaboration and joint activities are much encouraged.

In parallel with the scientific side, the initiative will be advertised to the public, the media and the schools with emphasis on its planetary aspect. Outreach activities developing awareness of the role of mathematics in the study of the planet and in the planetary issues will be organized everywhere on the planet.

These could include public lectures, panels on the mathematical challenges coming from sustainability issues, radio or television programs, exhibitions, articles in the newspapers, etc. Activities will be organized in the schools: posters; special issues of magazines; websites; exhibitions; invitation to associations of teachers that they hold their annual congress on the theme; lectures in the schools; special projects for the classrooms. International collaboration is encouraged to maximize the visibility of the initiative. For instance, posters produced in one country can be distributed in another country. The same can be done with magazines distributed in the schools.

The theme is so rich that it allows the members of the mathematical community and the different organizations to contribute to the initiative in a creative way. Indeed, Mathematics of Planet Earth is much broader than sustainability issues. It includes many subjects related to the knowledge of our planet, its origin and history, its soils, its ecosystems and living species, its social organizations, etc., which may be covered by activities.

CMS and Canada have a long tradition of collaboration in the mathematical sciences, both on the research and education sides and the origin of the initiative is Canadian. Already the institutes together with BIRS, MITACS and AARMS are collaborating on the planning of joint thematic activities in 2013. With the help of the community there are many more things we could do. For instance, CMS could hold one of its meetings on the theme and play a role in other international events related to the initiative.

It is also an occasion to increase our collaboration with other disciplines. On the outreach side, we can invite the provincial teachers associations to hold their annual congress on the theme. We can publish special issues of Accromath and Pi in the Sky, and increase the distribution of the special issues.

We could join forces with the American learned societies in the planning of the 2013 Math Awareness Month. I hope that you will have enthusiasm for more projects around Mathematics of Planet Earth 2013, so that it becomes an exceptional opportunity to show the relevance of mathematics in our society and the vitality of Canadian mathematics.

Christiane Rousseau
Universite of Montreal
Vice-president of the International Mathematical Union
rousseac@dms.umontreal.ca

CALL FOR NOMINATIONS / APPEL DE MISES EN CANDIDATURE

Prix Adrien-Pouliot Award

Nominations of individuals or teams of individuals who have made significant and sustained contributions to mathematics education in Canada are solicited. Such contributions are to be interpreted in the broadest possible sense and might include: community outreach programs, the development of a new program in either an academic or industrial setting, publicizing mathematics so as to make mathematics accessible to the general public, developing mathematics displays, establishing and supporting mathematics conferences and competitions for students, etc.

Nominations must be received by the CMS Office no later than **April 30, 2011**.

Please submit your nomination electronically, preferably in PDF format, to apaward@cms.math.ca.

Nomination requirements:

- Include contact information for both nominee and nominator.

- Describe the nominated individual's or team's sustained contributions to mathematics education. This description should provide some indication of the time period over which these activities have been undertaken and some evidence of the success of these contributions. This information must not exceed four pages.

- Two letters of support from individuals other than the nominator should be included with the nomination.

- Curricula vitae should not be submitted since the information from them relevant to contributions to mathematics education should be included in the nomination form and the other documents mentioned above.

- If nomination was made in the previous year, please indicate this.

- Members of the CMS Education Committee will not be considered for the award during their tenure on the committee.

Renewals

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

Nous sollicitons la candidature de personne ou de groupe de personnes ayant contribué d'une façon importante et soutenue à des activités mathématiques éducatives au Canada. Le terme « contributions » s'emploie ici au sens large; les candidats pourront être associés à une activitée de sensibilisation, un nouveau programme adapté au milieu scolaire ou à l'industrie, des activités promotionnelles de vulgarisation des mathématiques, des initiatives, spéciales, des conférences ou des concours à l'intention des étudiants, etc.

Les mises en candidature doivent parvenir au bureau de la SMC avant le **30 avril 2011**.

Veuillez faire parvenir votre mise en candidature par voie électronique, de préférence en format PDF, à prixap@smc.math.ca.

Conditions de candidature

- Inclure les coordonnées du/des candidats ainsi que le(s) présentateur(s).

- Décrire en quoi la personne ou le groupe mise en candidature a contribué de façon soutenue à des activités mathématiques. Donner un aperçu de la période couverte par les activités visées et du succès obtenu. La description ne doit pas être supérieur à quatre pages.

- Le dossier de candidature comportera deux lettres d'appui signées par des personnes autres que le présentateur.

- Il est inutile d'inclure des curriculums vitae, car les renseignements qui s'y trouvent et qui se rapportent aux activités éducatives visées devraient figurer sur le formulaire de mise en candidature et dans les autres documents énumérés ci- dessus.

- Si la mise en candidature a été soumise en l'année précédente, s'il vous plaît indiquez-le.

- Les membres du Comité d'éducation de la SMC ne pourront être mise en candidature pour l'obtention d'un prix pendant la durée de leur mandat au Comité.

Renouveler une mise en candidature

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

Prix G. de B. Robinson 2010 G. de B. Robinson Award
Andrew Toms (Purdue University)   Wilhelm Winter (University of Nottingham, UK)

The CMS is pleased to announce that Andrew Toms and Wilhelm Winter are the recipients of the 2010 G. de B. Robinson Award for their paper Z-Stable ASH Algebras, published in the Canadian Journal of Mathematics (60:3 2008, 703-720).

The G. de B. Robinson Award was inaugurated to recognize the publication of excellent papers in the Canadian Journal of Mathematics and the Canadian Mathematical Bulletin and to encourage the submission of the highest quality papers to these journals. The first award was presented in 1996.

Andrew Toms

Wilhelm Winter

La SMC est heureuse d'annoncer qu'elle decerne son prix G. de B. Robinson 2010 a Andrew Toms et Wilhelm Winter pour leur article "$\mathcal{Z}$-Stable ASH Algebras", publie dans le Journal Canadien de Mathematiques (60:3 2008, 703-720).

Le prix G. de B. Robinson rend hommage aux mathematiciens qui se sont distingues par l'excellence de leurs articles parus dans le Journal canadien de mathematiques et le Bulletin canadien de mathematiques, et vise a encourager la presentation d'articles de premiere qualite pour ces revues. Le premier prix a ete decerne en 1996.

One of the main results of the Toms-Winter paper is to show that every class of C*-algebras which has been classified in this program is Z-stable. Until the work of Toms and Winter, almost none of the algebras classified were known to be Z-stable. More generally, they show that every separable, approximately divisible C*- algebra is Z-stable.

The paper makes an important contribution to the (Elliott) program to classify simple, separable nuclear C*-algebras by their K-theoretic invariants.

The Jiang-Su algebra (the Z in the title) is a simple C*-algebra which is Ktheoretically equivalent to C. A C*-algebra is Z-stable if it is isomorphic to its tensor product with Z. It is conjectured that the Z-stable, separable, nuclear C*-algebras is the set of C*-algebras which are classifiable by their K-theory.

ASH algebras are C*-algebras which can be obtained as inductive limits of subalgebras of homogeneous C*-algebras, which are spaces of functions with values in a matrix algebra. This technical property has been verified for a wide class of C*-algebras, and it is a key device for many of the deep results in the discipline. In this paper, a large class of ASH algebras including those which were known to be classifiable are shown to be Z-stable, even when they are not approximately divisible.

These results led to more recent work by the authors showing that if is a minimal homeomorphism of an infinite compact, finite dimensional metric space X, then the crossed product $C(X) \times_\otimes Z$ is Z-stable. This allows the use of K-theory invariants to analyze these dynamical systems.

Andrew Toms was born in Montreal in 1975, and was raised on Prince Edward Island. He attended Queen's University as an undergraduate and obtained his Ph.D. from the University of Toronto in 2002. After holding faculty positions at the University of New Brunswick and York University, he was appointed Associate Professor in the Department of Mathematics at Purdue University in 2010. Toms' mathematical interests include the classification of C*-algebras and points of contact between operator algebras, logic, and topology.

Wilhelm Winter was born in Germany in 1968; he studied mathematics and physics at the Universities of Heidelberg and Muenster, where he received his PhD in 2000. He continued to work in Muenster until his Habilitation in 2006. Since 2007 he holds a lectureship at the University of Nottingham, UK.

The collaboration between Toms and Winter commenced in 2003, and has since resulted in a series of seven joint papers.

Un des principaux resultats du papier Toms-Winter est de demontrer que toutes les classes de C*-algebres qui furent classiees dans ce programme sont $\mathcal{Z}$-stables. Avant le travail de Toms et Winter, presque aucune algebre classiee etait con-nue comme etant $\mathcal{Z}$-stable. Plus generalement, ils demontrent que toute C*-algebre separable et approximativement divisible est $\mathcal{Z}$-stable.

Le document apporte une contribution importante au programme (Elliott) a classier les C*-algebres simples, separables et nucleaires par leur invariance en K-theorie. L'algebre de Jiang-Su ($\mathcal{Z}$ dans le titre) est une C*-algebre simple K-theoriquement equivalente a C. Une C*-algebre est $\mathcal{Z}$-stable si elle est iso- morphe a son produit tensoriel avec $\mathcal{Z}$. Il est conjecture que les C*-algebresseparables, nucleaires et $\mathcal{Z}$-stables est l'ensemble des C*-algebres classiables par leur K-theorie.

Les algebres de ASH sont des C*-algebres qu'on peut obtenir comme des limites inductives de sous-algebres de C*-algebres homogenes, qui sont des espaces de fonctions a valeurs dans une algebre de matrices. Cette propriete fut veriee pour une grande classe de C*-algebres, et elle est un outil important pour de nombreux resultats substantiels dans la discipline. Dans cet article, une grande classe d'algebres de ASH y compris ceux qui etaient connues comme etant clas- siables sont demontrees comme etant $\mathcal{Z}$-stables, même quand elles ne sont pas approximativement divisibles.

Ces resultats ont ouvert la voie a des travaux plus recents des auteurs ou ils montrent que si est un homeomorphisme minimal d'un espace metrique X inni, compact et de dimension nie, alors le produit $C(X) \times_\alpha \mathcal{Z}$ est $\mathcal{Z}$-stable. Ceci permet d'utiliser les invariants de la K-theorie pour analyser ces systemes dynamiques.

Andrew Toms est ne a Montreal en 1975 et a grandi a l'Ile du Prince Edouard. Il a fait ses etudes de premier cycle a l'Universite Queen's et a obtenu son doctorat de l'Universite de Toronto en 2002. Apres avoir occupe des postes a l'Universite du Nouveau-Brunswick et l'Universite York, il a ete nomme professeur agrege a l'Universite Purdue en 2010. Il s'interesse a la classication des C*-algebres et aux liens entre les algebres d'operateurs, la logique et la topologie.

Wilhelm Winter est ne en Allemagne en 1968. Il a etudie les mathematiques et la physique aux universites de Heldelberg et Muenster, obtenant son doctorat de cette derniere en 2000. Il a continue de travailler a Muenster jusqu'a son Habilitation en 2006. Depuis 2007, il occupe un poste a l'universite de Notting- ham au Royaume-Uni.

Toms et Winter collaborent depuis 2003, et ont publié depuis sept articles conjoints.

Prix Graham Wright pour service méritoire 2010 Graham Wright Award for Distinguished Service
Robert Woodrow (University of Calgary)

Robert has been a professor with the Department of Mathematics and Statistics at the University of Calgary since 1980. During his tenure he has served as Deputy Provost and Associate Vice President (Academic), Associate and Vice Dean (Science), and Chair of the Pure Mathematics division.

Robert is deeply committed to mathematics education initiatives and has assisted with mathematical competitions, the Shad Valley Enrichment Program, and training students for the Canadian and International Math Olympiads. He has also organized and co-taught the Wednesday Mathematics Evenings at the University of Calgary since 1980. The Wednesday Mathematics Evenings is a weekly enrichment program for high school students who challenge themselves with advanced mathematical puzzles and learn from a group of like-minded peers.

A lifetime member of the CMS, Robert has been actively involved with the Society for over 30 years, including serving on the Board of Directors, the Education Committee, and the Advancement of Mathematics Committee. He is currently the Faculty Advisor to the Student Committee, a position he has held since 1998. He has contributed significantly to the problem-solving journal CRUX with MAYHEM, having written the Olympiad/Skoliad Corner since 1987 and serving as Co-Editor in Chief of the journal from 1992-1997.

Robert received his BSc in Mathematics from the University of Calgary in 1971, and his PhD from Simon Fraser University in 1977 under the direction of A.H. Lachlan. His research interests are in logic and model theory, with applications to combinatorics, graphs, order, and relations.

Robert Woodrow has been an active contributor to Canadian mathematics throughout his entire career, and his remarkable dedication to mathematics education and to the CMS makes him a worthy recipient of this award.

Robert Woodrow and Jacques Hurtubise

Robert est professeur à la faculté des mathématiques et des statistiques de la University of Calgary depuis 1980. Depuis ses débuts à cet établissement, il a été vice-recteur et vice-président associé (Académique), doyen associé et vice-doyen (Sciences) et président de la division des Mathématiques pures.

Robert s'engage très activement à des projets d'éducation en mathématiques et a aidé à organiser des concours de mathématiques, le Shad Valley Enrichment Program, et la formation d'étudiants pour les olympiades de mathématiques canadiennes et internationales. Il organise – et y enseigne conjointement – les soirées de mathématiques du mercredi à la University of Calgary depuis 1980. Il s'agit d'un programme d'enrichissement hebdomadaire à l'intention d'étudiants du secondaire qui se donnent pour défi de trouver la solution à des casse-tête mathématiques avancés et qui apprennent d'un groupe de pairs partageant les mêmes intérêts.

Membre à vie de la SMC, Robert contribue activement aux activités de la SMC depuis plus de 30 ans. Il a été notamment membre du Conseil d'administration, du Comité d'éducation et du Comité pour l'avancement des mathématiques. Il est actuellement conseiller enseignant aux membres du Comité d'étudiants, poste qu'il occupe depuis 1998. Il a contribué énormément à la revue de résolution de problèmes CRUX avec MAYHEM. Il rédige le Coin olympiade/Skoliad depuis 1987 et a été corédacteur en chef du journal de 1992 à 1997.

Robert a reçu son bachelier ès sciences (mathématiques) de la University of Calgary en 1971 et son doctorat de la Simon Fraser University en 1977, sous la direction de A.H. Lachlan. Ses sujets d'intérêt en matière de recherche sont la logique et la théorie des modèles, avec des applications à la combinatoire, aux graphiques, à l'ordre et aux relations.

Robert Woodrow a contribué activement au domaine des mathématiques au Canada tout au long de sa carrière, et son dévouement remarquable à l'enseignement des mathématiques et à la SMC fait de lui un candidat fort méritant à ce prix.

Prix de Doctorat 2010 Doctoral Prize
Benjamin Young (Carleton University)

In his thesis work, Benjamin Young proved several outstanding conjectures concerning "box counting." He was able to count the number of ways in which one can pile coloured boxes in a corner with various predetermined colour schemes. The answers came in the form of generating functions in several variables.

These whimsical sounding problems in fact have deep connections to statistical mechanics, representation theory, algebraic geometry, and mathematical physics, and the conjectures which Young solved arose from the interactions of these subjects. To solve the problems, Young developed a novel use of vertex operator algebras to relate several of these problems to each other in an unexpected way. His solution to Szendroi's conjecture concerning pyramid partitions, and Bryan's conjecture concerning boxes coloured by the Klein group have proved to be important advances in Donaldson-Thomas theory—an algebro-geometric counterpart to topological string theory in physics.

Benjamin Young received his B. Math and M.Sc from Carleton University. He received his Ph.D. in mathematics at the University of British Columbia, working under the joint supervision of Jim Bryan and Richard Kenyon. After graduation, he was awarded a postdoctoral fellowship from the Centre de Recherches Mathématiques (CRM) held at McGill University. He is currently participating in the program of Random Matrix Theory, Interacting Particle Systems and Integrable Systems at the Mathematical Sciences Research Institute (MSRI) in Berkeley, California. He will subsequently attend KTH Royal Institute of Technology in Stockholm for a Wallenberg Postdoctoral Fellowship.
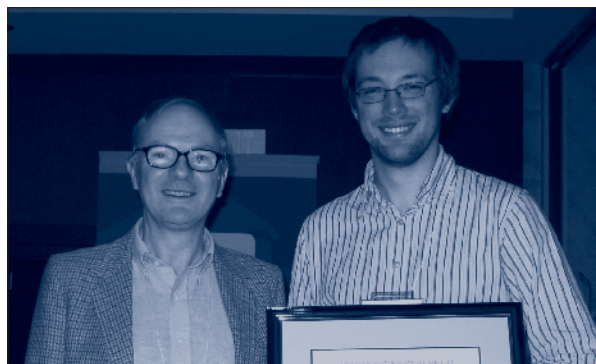
David Brydges and Benjamin Young

Dans sa thèse, Benjamin Young prouve plusieurs conjectures exceptionnelles à propos du « comptage de boîtes». Il a réussi à calculer le nombre de façons d'empiler des boîtes de couleur dans un coin avec divers thèmes de couleurs prédéterminés. Les réponses se sont présentées sous la forme de fonctions génératrices de plusieurs variables.

Ces problèmes à l'allure fantaisiste sont en fait étroitement liés à la mécanique statistique, à la théorie des représentations, à la géométrie algébrique et à la physique mathématique, et les conjectures résolues par Young sont issues des interactions entre ces domaines. Pour résoudre les problèmes, Young a inventé un usage novateur des algèbres vertex pour relier les problèmes l'un à l'autre d'une façon inattendue. Sa solution à la conjecture de Szendroi concernant les partitions pyramidales et la conjecture de Bryan concernant les boîtes de couleur par le groupe Klein se sont révélés d'importantes avancées pour la théorie de Donaldson-Thomas, contrepartie algébro-géométrique de la théorie topologique des cordes, en physique.

Benjamin Young a obtenu son baccalauréat en mathématiques et sa maîtrise en sciences de l'Université Carleton. Il a fait son doctorat en mathématiques à l'Université de la Colombie-Britannique, sous la direction de Jim Bryan et de Richard Kenyon. Il a ensuite obtenu une bourse du Centre de recherches mathématiques pour faire un stage postdoctoral à l'Université McGill. En ce moment, il participe à un programme de la théorie des matrices aléatoires, les systèmes de particules en interaction et les systèmes intégrables au Mathematical Sciences Research Institute à Berkeley, en Californie. Il se rendra ensuite au KTH Royal Institute of Technology à Stockholm, qui lui a accordé la bourse de recherche postdoctorale Wallenberg.

DU BUREAU DU VICE-PRÉSIDENT *SUITE*

Bien qu'il soit exagéré de dire qu'il existe un lien étroit entre la recherche pure et appliquée, il n'est certainement pas exagéré d'affirmer qu'on peut établir de nombreux ponts entre les deux. De nombreuses théories mathématiques ont été élaborées dans le contexte d'une « recherche fondée sur la curiosité », motivée uniquement par leur beauté intrinsèque, mais qui, au fil du temps, ont fini par jouer un rôle crucial dans le contexte de la recherche appliquée. N'oublions pas non plus que de nouveaux problèmes découlent du domaine des applications et que leur résolution nécessite la participation des mathématiciens dans le domaine de la recherche pure. Une initiative de recherche saine doit donc reconnaître, valoriser et encourager les contributions de ces deux aspects.

1 M. Jacobson, A. Menezes, A. Stein, « Solving elliptic curve discrete logarithm problems using Weil descent » , *J. Ramanujan Math. Soc.*, 16(2001), 231-260.

2 S.-T. Yau et S. Nadis, *The Shape of Inner Space*, p.290, Basic Books, New York, 2010.

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Prix Adrien Pouliot 2010 Adrien Pouliot Award
Miroslav Lovric (McMaster University)

Miroslav Lovric and Harley Weston

The 2010 Adrien Pouliot Award is awarded to Miroslav Lovric of McMaster University for his outstanding contributions to the teaching and learning of mathematics in Canada. Miroslav is an innovator, all the way from his development of a course which trained and mentored undergraduate tutors for his large applied calculus course, to his more recent concentration on literacy at the undergraduate level and the design of textbooks. His involvements in mathematics education range from the development of curricula and teaching resources, to current collaborative research.

Lovric's teaching career began at McMaster University in 1991. He noticed many of the students in his first year classes having difficulties and began investigating the transition from high school to university. In 2001 he began conducting an annual survey of his students regarding their mathematics background and attitudes towards mathematics. Based on this research, Lovric created a Mathematics Review Manual to help students prepare for university mathematics, which was published in 2010 under the title Calculus: Fear No More.

In addition to this manual, Lovric has written his own textbook on vector calculus and is currently working on a textbook on math for the life sciences. He has extensively researched the role of textbooks in improving the teaching and learning of mathematics.

Lovric also plays an active role in the training and professional development of present and future teachers. A significant innovation was his "Teaching Mathematics" course, introduced at McMaster University in 1999 for undergraduate mathematics teaching assistants.

Lovric takes his commitment to math education beyond the classroom. Each summer he works with the Shad Valley enrichment program, which provides academic and entrepreneurial opportunities to high school students interested in math and science. He is also a member of the steering committee for the Fields Institute Mathematics Education Forum, and frequently speaks at public lectures on broad issues of mathematics and education.

Lovric studied mathematics at the University of Zagreb in Croatia and completed his PhD thesis in Riemannian Geometry at Ohio State University in 1990. Lovric's mathematical research deals with certain aspects of the curvature of a Riemannian manifold, in particular, the way various curvature assumptions influence topological properties. He is a 3M Teaching Fellow (2001) and a winner of the Government of Ontario Leadership in Faculty Teaching Award (2007).

Le prix Adrien Pouliot 2010 est décerné à Miroslav Lovric de McMaster University pour sa contribution exceptionnelle à l'enseignement et à l'apprentissage des mathématiques au Canada. Miroslav est un innovateur, de sa création d'un cours qui a permis de former et d'encadrer des tuteurs de premier cycle pour son imposant cours sur le calcul infinitésimal appliqué, à sa concentration plus récente sur l'alphabétisme au premier cycle et la conception de manuels de cours. Citons parmi ses contributions à l'enseignement des mathématiques l'élaboration d'un programme d'études et de ressources d'enseignement et sa recherche concertée actuelle.

La carrière de M. Lovric en enseignement a commencé à la McMaster University en 1991. Il a constaté que de nombreux étudiants dans ses classes de première année avaient de la difficulté et a commencé à examiner le passage du secondaire à l'université. En 2001, il a lancé un sondage annuel auprès de ses étudiants au sujet de leurs antécédents en mathématique et de leur attitude à l'égard de cette discipline. Grâce à sa recherche, M. Lovric a pu créer un manuel de révision en mathématiques pour aider les étudiants à se préparer aux mathématiques au niveau universitaire. L'ouvrage a été publié en 2010 sous le titre Calculus: Fear No More.

Outre ce manuel, M. Lovric a rédigé son propre manuel de classe sur le calcul vectoriel et prépare actuellement un autre manuel de classe sur la mathématique pour les sciences de la vie. Il a étudié en profondeur le rôle des manuels de classe dans l'amélioration de l'enseignement et l'apprentissage des mathématiques.

Monsieur Lovric s'intéresse aussi activement à la formation et au perfectionnement professionnel des enseignants d'aujourd'hui et de demain. Citons comme une des grandes innovations, son cours intitulé Teaching Mathematics qui a été offert pour la première fois à la McMaster University en 1999 et qui s'adresse aux aides enseignants des mathématiques au premier cycle.

L'engagement de M. Lovric à l'égard de l'enseignement des mathématiques va au-delà de la salle de classe. À tous les étés, il collabore au programme d'enrichissement de Shad Valley, qui offre des occasions d'études et des occasions entrepreneuriales à des étudiants du secondaire s'intéressant aux mathématiques et à la science. Il est également membre du comité directeur du Mathematics Education Forum de la Fields Institute et est fréquemment invité à donner des présentations publiques sur des questions générales touchant les mathématiques et l'enseignement.

Monsieur Lovric a étudié les mathématiques à l'Université de Zagreb en Croatie et a fait sa thèse de doctorat en géométrie de Riemann à la Ohio State University en 1990. La recherche en mathématique de M. Lovric porte sur certains volets de la courbure d'une variété riemannienne, en particulier la façon dont diverses hypothèses liées aux courbures influent sur les propriétés topologiques. Il a été lauréat d'un prix 3M pour l'excellence en enseignement (2001) et lauréat du Prix de leadership professoral du gouvernement de l'Ontario (2007).

Prix David Borwein de mathématicien émérite pour l'ensemble d'une carrière 2010 David Borwein Distinguished Career Award
Nassif Ghoussoub (University of British Columbia)

Dr. Nassif Ghoussoub is a world class mathematician who, over his career, has made significant contributions on the domestic and international stage. His research has been significantly influential in such areas as partial differential equations, variational methods, critical point theory, infinite dimensional Morse theory, geometrical Banach space theory, and optimization. At the same time he was the driving force behind the creation of the Pacific Institute for the Mathematical Sciences, the Banff International Research Station, and the MITACS Network of Centres of Excellence.

Nassif Ghoussoub and Jacques Hurtubise

Nassif Ghoussoub est un mathématicien de renommée mondiale qui, durant toute sa carrière, a contribué de façon exceptionnelle à son domaine, sur la scène nationale et internationale. Ses recherches ont marqué de façon importante des domaines comme les équations différentielles partielles, les méthodes de la variation de la constante, la théorie du point critique, la théorie de Morse et la dimension infinie, la théorie géométrique des espaces de Banach et l'optimisation. Il est en outre la force motrice derrière la création de l'Institut du Pacifique pour les sciences mathématiques, la Station de recherche internationale de Banff et les Réseaux de centres d'excellence MITACS.

Dr. Ghoussoub's seminal 1993 Cambridge Press monograph "Duality and Perturbation Methods in Critical Point Theory" introduced many ideas and methods from his own then-recent work into the calculus of variations, including the far-reaching min-max principle involving duality and a Morse theory "up to epsilon" to deal with borderline variational problems. The influence of this book in the field, and in particular on the recent advances in Hartree-Fock-Dirac theory by Esteban and Sere and related problems in quantum chemistry by Lewin, can hardly be overestimated.

Among the highlights of his one hundred plus papers is his resolution with Gui of De Giorgi's Conjecture, a long-standing open problem, first with a complete solution in dimension two, followed by major advances in dimensions up to five. This work is described as a "magnificent breakthrough", involving original ideas with other applications to the study of elliptic partial differential equations.

In collaboration with his students, Dr. Ghoussoub has developed and advanced many important concepts in mathematical research, including a unified framework for several important geometric inequalities, a new and far-reaching approach to the calculus of variations, and a rigorous mathematical analysis of various partial differential equations proposed by engineers and applied mathematicians for Electrostatic Micro-Electromechanical Systems (MEMS).

Nassif Ghoussoub obtained his Doctorat d'état in 1979 from the Université Pierre et Marie Curie in Paris, France and is currently a Professor of Mathematics and a Distinguished University Scholar at the University of British Columbia. His academic distinctions include the Coxeter-James Prize (1990), a UBC Killam Senior Research Fellowship (1992), the Jeffrey-Williams Prize (2007), and the UBC Faculty of Science Achievement Award for outstanding service and leadership (2007). He was elected Fellow of the Royal Society of Canada in 1993, and was awarded a 2004 Doctorat Honoris Causa from the Université Paris-Dauphine.

Nassif is currently serving on the Killam committee at the Canada Council for the Arts (2007-2010). He was vice-president of the Canadian Mathematical Society from 1994 to 1996, and editor-in-chief of the Canadian Journal of Mathematics from 1993 to 2002. He was the founding Director of the Pacific Institute for the Mathematical Sciences (PIMS) for 1996-2003, a co-founder of the MITACS Network of Centres of Excellence (Mathematics of Information Technology & Complex Systems) and a member of its Board of Directors (1998-2003). He currently serves on the Board of Governors of the University of British Columbia and is the scientific director of the Banff International Research Station (BIRS) that he founded in 2003.

Dans un ouvrage intitulé Duality and Perturbation Methods in Critical Point Theory paru chez Cambridge Press en 1993, il a présenté de nombreuses idées et méthodes tirées de ses derniers travaux sur le calcul des variations, notamment sur le puissant principe min-max avec dualité et une théorie de Morse "à epsilon près" pour pouvoir traiter des équations différentielles qui manquent de compacité. On pourrait difficilement surestimer l'influence de cet ouvrage dans le domaine, en particulier sur les percées récentes d'Esteban et Sere dans la théorie de Hartree-Fock-Dirac, et de Lewin sur des problèmes connexes de chimie quantique.

Entre autres hauts faits de la centaine d'articles (et plus) qu'il a publiés, mentionnons sa résolution, avec Gui, de la conjecture de De Giorgi, problème demeuré longtemps sans solution. Il a d'abord trouvé une solution complète en dimension deux, suivie de percées importantes allant jusqu'en dimensions cinq. Ces travaux ont été qualifiés de « découverte magnifique », car ils combinent des idées originales à d'autres applications de l'étude des équations aux dérivées partielles elliptiques.

De concert avec ses étudiants, Dr Ghoussoub a mis au point et fait progresser de nombreux concepts importants en recherche mathématique, y compris un cadre unifié pour plusieurs inégalités géométriques importantes, une nouvelle démarche d'une grande portée au calcul infinitésimal des variations et une analyse mathématique rigoureuse de diverses équations différentielles partielles proposées par les ingénieurs et les mathématiciens en mathématiques appliquées pour les systèmes micro-électromécaniques électrostatiques (SMEE).

Nassif Ghoussoub a obtenu son Doctorat d'État en 1979 de l'Université Pierre et Marie Curie à Paris (France). Il est maintenant professeur de mathématiques et Distinguished University Scholar à l'Université de la Colombie-Britannique (UBC). Au nombre de ses récompenses, mentionnons le prix Coxeter-James (1990), une bourse de chercheur principal Killam UBC (1992), le prix Jeffrey-Williams (2007) et le prix d'excellence de la Faculté des sciences de l'UBC pour service méritoire et leadership exceptionnels (2007). Il est devenu Membre de la Société royale du Canada en 1993 et a reçu un doctorat honorifique de l'Université Paris-Dauphine en 2004.

Nassif est actuellement membre du comité Killam du Conseil des Arts du Canada (2007-2010). Il a été vice-président de la Société mathématique du Canada de 1994 à 1996 et rédacteur en chef du Journal canadien de mathématiques de 1993 à 2002. Il est directeur fondateur de l'Institut du Pacifique pour les sciences mathématiques (PIMS), qu'il a dirigé de 1996 à 2003, et il a cofondé les Réseaux de centres d'excellence MITACS (Mathematics of Information Technology & Complex Systems), dont il a été membre du conseil d'administration de 1998 à 2003. Il siège en ce moment au conseil des gouverneurs de l'Université de la Colombie-Britannique et il est directeur scientifique de la Station de recherche internationale de Banff, qu'il a fondée en 2003.

Prix Krieger-Nelson 2010 Krieger-Nelson Prize
Lia Bronsard (McMaster University)

Lia Bronsard is one of Canada's leading mathematical analysts, whose interests lie in the field of partial differential equations and the calculus of variations. She specializes in the study of singular limits of solutions of partial differential equations. Her research brings rigorous methods of analysis to bear on problems arising in the physical sciences, and in particular those involving singular geometrical structures such as vortices, phase transition layers, and grain boundaries.

David Brydges and Lia Bronsard

Bronsard was born in Québec in 1963 and received her Baccalauréat ès Sciences, in mathematiques from the Université de Montréal in 1983. She received her Ph.D. in 1988 from the Courant institute of Mathematical Sciences at New York University, working with R. V. Kohn on the De Giorgi conjecture connecting singularly perturbed reaction-diffusion equations and mean curvature flow. After her degree, she held positions at Brown University, the Institute for Advanced Study, and the Center for Nonlinear Analysis at Carnegie - Mellon University. In 1992, she moved to McMaster University, where she is now a Professor of Mathematics.

During the period after her thesis, Bronsard worked on energy driven pattern formation in collaboration with B. Stoth and others. Her paper with F. Reitich on the structure of triple-junction layers in grain boundaries, from her period at CMU, was the first mathematical analysis of these multiphase singular structures and has been highly influential.

In her current research, Bronsard studies the detailed structures of vortices in the phenomenon of Bose - Einstein condensation and in the Ginzburg - Landau models of superconductivity. In this area, her work, in collaboration with S. Alama, T. Giorgi, P. Mironescu, E. Sandier and colleague J. Berlinsky from Physics at McMaster University, sets a very high standard of quality, and is a model of interdisciplinary research.

Lia Bronsard fait nettement partie de l'élite canadienne en analyse mathématique. Elle travaille dans le domaine des équations aux dérivées partielles et du calcul variationnel. Elle s'intéresse particulièrement aux limites de solutions singulières des équations aux dérivées partielles. Ses travaux apportent la rigueur de l'approche analytique à des questions soulevées en sciences physiques, en particulier aux questions concernant des structures géométriques singulières, telles que les vortex, les interfaces dans les matériaux, et les joints de grains.

Lia Bronsard est née à Québec en 1963 et elle a obtenu son Baccalauréat ès Science (B. Sc.) en mathématique à l'Université de Montréal en 1983. Elle a obtenu son doctorat en 1988 au « Courant Institute for Mathematical Sciences », à l'Université de New York, sous la direction de R. V. Kohn. Sa thèse porte sur la conjecture de De Giorgi reliant les équations de type réaction-diffusion avec perturbation singulières à l'évolution par courbure moyenne. Après son doctorat, elle a complété des stages post-doctoraux à l'Université de Brown, à l' « Institute for Advanced Study », et au « Centre for Nonlinear Analysis » de l'Université de Carnegie-Mellon. En 1992, elle est devenue membre du département de mathématiques de l'Université de McMaster, où elle est présentement professeur.

Après sa thèse, Lia Bronsard a travaillé, en collaboration entre autres avec B.Stoth, sur la formation et évolution des structures induites par l'énergie. Son article avec F. Reitich sur les interfaces avec jonctions triples pour un modèle de grains dans les matériaux a eu une grande influence en proposant une première analyse mathématique de ces structures singulières à phases multiples.

Lia Bronsard travaille actuellement sur les structures fines de vortex liées au phénomène de condensation de Bose-Einstein et aux modèles de supraconductivité de Ginzburg-Landau. Son travail dans ce domaine, en collaboration avec S. Alama, T. Giorgi, P. Mironescu, E. Sandier et son collègue J. Berlinsky du département de physique à McMaster, fixe les normes de qualités, et constitue un modèle de recherche interdisciplinaire.

CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

APRIL	2011	AVRIL

4 – 8 Workshop on Fourier Law and related topics
(Fields Institute, Toronto, ON)
`www.fields.utoronto.ca/programs/scientific/`

11 – 15 Arithmetic Statistics (MSRI, Berkeley, CA)
`www.msri.org/web/msri/scientific/`
`show/-/event/Wm540`

13 – 15 Coxeter Lecture Series – S. R. S. Varadhan
(Fields Institute, Toronto, ON)
`www.fields.utoronto.ca/programs/scientific/`

18 – 22 Computational Statistical Methods for Genomics
and Systems Biology (CRM, Montreal, QC)
`www.crm.umontreal.ca/Stat2011/`

MAY	2011	MAI

1 – Aug 31 MITACS International Focus Period on Advances in Network
Analysis (locations in Canada)
`www.mitacsfocusperiods.ca`

2 – 4 Statistical Issues in Forest Management (CRM, Montreal, QC)
`www.crm.umontreal.ca/Forest11/`

9 – 13 Causal Inference in Health Research
(CRM, Montreal, QC)
`www.crm.math.ca/Stat2011/en`

13 – 15 Connections in Geometry and Physics 2011
(Fields Institute, Toronto, ON)
`www.math.uwaterloo.ca/~gap`

16 – 19 Analysis of Survival and Event History Data
(CRM, Montreal, QC)
`www.crm.umontreal.ca/Stat2011/`

16 – 19 SIAM Conference on Optimization, (Darmstadt, Germany)
`www.siam.org/meetings/op11`

18 – 25 Arctic Number Theory School (Univ.of Helsinki, Finland)
`www.helsinki.fi/~ernvall/ntsummer/`

25 – 28 6th International conference on Dynamic Systems (Atlanta, GA)
`www.dynamicpublishers.com/icdas6.htm`

31 – June 3 Canadian Discrete and Algorithmic Mathematics (CanaDAM)
(Conference, Victoria, BC)
`http://canadam.math.ca/2011/`

JUNE	2011	JUIN

3 – 5 **CMS Summer Meeting**
University of Alberta, Edmonton, AB
`www.cms.math.ca`

7 – 9 4th International Workshop on Symbolic Numeric
Computation (San Jose, CA)
`www.cargo.wlu.ca/SNC2011/`

12 – 15 Statistical Society of Canada (SSC) Annual Meeting,
(Wolfville, NS)
`www.ssc.ca/en/meetings/2011`

13 – 17 Workshop on Hamiltonian Systems
(Fields Institute, Toronto, ON)
`www.fields.utoronto.ca/programs/scientific/`

16 – 18 Lorenz Geometry in Mathematics and Physics (Strasbourg, Fr)
`www-irma.u-strasbg.fr/article1044.html`

19 – 25 49th International Symposium on Functional Equations
(Graz, Austria)
`jens.schwaiger@uni-graz.at`

22 – 25 26th Annual IEEE Symposium on Logic in Computer Science
(Fields Institute event at the University of Toronto)
`www.fields.utoronto.ca/programs/`
`scientific/10-11/lics11`

28 – July 8 Metric measure spaces, geometry and analytical aspects
(CRM, Montreal, QC)
`www.dms.umontreal.ca/~sms/Metric11/`
`index_e.php`

JULY	2011	JUILLET

4 – 10 Conference on Topology and its Applications
(Islamabad, Pakistan)
`icta@comsats.edu.pk`
`http://ww2.ciit-isb.edu.pk/math`

6 – 8 International Conference on Applied and Engineering
Mathematics 2011 (London, U.K.)
`www.iaeng.org/WCE2011/`

18 – 22 ICIAM 2011, 7th International Congress on Industrial and
Applied Mathematics (Vancouver, BC)
`www.iciam2011.com`

26 – 29 Harmonic Analysis and PDE (Eric Sawyer)
(Fields Inst., Toronto, ON)
`www.fields.utoronto.ca/programs/`
`scientific/11-12/PDE/`

29 – 31 International Pure Mathematics Conference
(Islamabad, Pakistan)
`www.pmc.org.pk/`

SEPTEMBER	2011	SEPTEMBRE

7 – 9 IMA Hot Topics Workshop: Instantaneous Frequencies and
Trends for Nonstationary Nonlinear Data
(Minneapolis, Minnesota)
`www.ima.umn.edu/2011-2012/SW9.7-9.11/`

18 – 23 Resolution of Singularities and Related Topics – 80th Birthday
of Heisuke Hironaka
(Las Casas del Tratado, Tordesillas, Spain)
`www5.uva.es/hironaka/`

19 – 23 IMA Workshop: High Dimensional Phenomena
(Minneapolis, Minnesota)
`www.ima.umn.edu/2011-2012/W9.19-23.11/`

OCTOBER	2011	OCTOBRE

IMA Workshop: Large Graphs, Modeling, Algoritms and
Applications (Minneapolis, Minnesota)
`www.ima.umn.edu/2011-2012/W10.24-28.11/`

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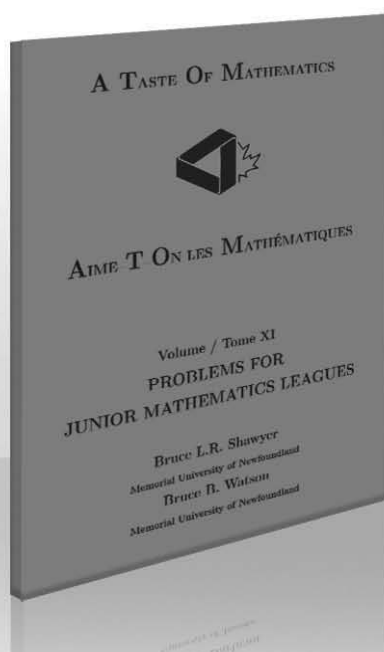Des suppléments sont applicables pour des places de choix - communiquer avec notes-ads@smc.math.ca. L'adhesion à la SMC comprend l'abonnement aux Notes de la SMC. Le tarif d'abonnement pour les non-membres est de 82 $ CDN si l'adresse de l'abonné est au Canada et de 82 $ US si l'adresse est à l'étranger.

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