CMS NOTES de la SMC

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FROM THE VICE-PRESIDENT'S DESK

Michael Lamoureux, *Calgary*

Accountability

As I write this article mid-October, I am, along with many of our colleagues, in the midst of applying for grants to support ongoing research programs and projects — fellow mathematical scientists are seeking funding through a wide variety of sources, including the federal tri-council organizations of CIHR, NSERC, and SSHRC, a wide variety of provincial agencies, the Networks of Centers of Excellence such as MITACS, the mathematical institutes through their program support, industrial sponsors including Canadian corporations and non-profits, as well as many others.

All of these funding agencies, governments, institutions, and companies require the researchers to present an accounting of progress made in the past, and require them to present well-developed plans for future progress. Time, money, effort goes into these research initiatives, both big and small, and the sponsors hold the researchers accountable for the expenditures of these limited resources to ensure the success of the sponsors' missions. Which is as it should be.

As mathematicians, much of our profession revolves around accountability. When we submit a scientific paper for publication, or give a talk at a conference, we are asserting that the work presented is accurate, new, and is our own, or otherwise is properly attributed. The referees and journal editors who review our work hold us accountable to certain standards to ensure the accuracy, novelty and ownership of this production. In our teaching, we are expected to present accurate, up-to-date information that is delivered in an effective manner that enables the students to learn. Our graduate students demand involvement in the latest, greatest research efforts. We are held accountable to certain expectations in the quality of our teaching by the scrutiny of our peers, department chairs, deans, as well as the students who raise the alarm when the teaching standards fall. We further promote accountability within the profession when we write reference letters for colleagues and students, perform tenure reviews, evaluate scholarship applications, even in assigning grades to students, where our efforts hold colleagues and students (colleagues-in-training) to certain standards that ensure the overall quality of our community.

It is curious that there is no serious "Hippocratic oath" for mathematical scientists, with an explicit statement of the principles of excellence and responsibility espoused by our community. (Although I have seen a less-serious version that begins "By this Math Oath, I swear to at least try not to be an Oaf...") It is also curious that accountability is not something that we teach explicitly to our students, but rather something we expect them to simply absorb from us, as if by osmosis.

My objective in this short note, though, is to point out that it is not just ourselves that must be held accountable. One of our tasks as a community of professionals is to hold accountable those bodies that provide the environment and resources which allow us to work and succeed in our own mission as mathematical scientists. At a university, for instance, it is the administration and the Board of Governors that set global conditions which may

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EDITORIAL

by Robert Dawson
Saint Mary's University, Halifax

I was starting this month's editorial late, after two midterms, a weekend conference, and a last-minute dash to get my NSERC Discovery Grant application in on time. Just then an email arrived from our administration, updating us on the plans that are in place to deal with the H1N1 outbreak. After thinking about it for a moment, I metaphorically ripped the page out of my typewriter and rolled in a new sheet. I hope that this editorial will be out of date by the time you read it; and I hope that none of you, or your families, friends, or students, will have been much affected. But it does seem that we do have to take the situation seriously.

It has been interesting to see the debate about immunization in the newspapers. Just when I thought that all but a handful of diehard contrarians had accepted that the tiny traces of mercury in vaccines were safe, I see usually-rational columnists writing that they will not get immunized because they cannot prove that the vaccine isn't dangerous. (A more serious obstacle - will there in fact be enough vaccine? We'll have to see. But if the supply lasts long enough that, expectant mothers, medical staff, and hockey players having been vaccinated, there are doses left for non-pregnant math professors, I will be out there with my sleeve rolled up. Professional pride demands that I defer to logic and probability.)

As I write, it is hard to know how normal the next month or two will be. Will our final examinations at Christmas go ahead as scheduled? Will our universities even stay open? Will the CMS winter meeting in Windsor have the usual crowds? Let's hope so... and good health and good luck to all of you in the coming year.

ÉDITORIAL

par Robert Dawson
Saint Mary's University, Halifax

J'ai commencé à rédiger mon éditorial de ce mois-ci en retard, après deux examens de mi-session, une fin de semaine de congrès et un sprint de dernière minute pour remettre à temps ma demande de Subvention à la découverte du CRSNG. Juste à ce moment-là, j'ai reçu un courriel de notre administration nous informant de la stratégie mise en place pour réagir au H1N1. Après y avoir réfléchi un certain temps, j'ai chiffonné mon brouillon et tout recommencé sur une nouvelle feuille blanche (façon de parler bien sûr). J'espère que cet éditorial ne sera pas dépassé au moment où vous le lirez… Et j'espère qu'aucun d'entre vous ni de vos proches, amis ou étudiants n'aura été trop durement touché. Il semble toutefois que nous soyons forcés de prendre la situation au sérieux.

La couverture médiatique sur la vaccination ne manque pas d'intérêt. J'étais pratiquement convaincu que la quasi-totalité de la planète, hormis une poignée d'irrésistibles, avait accepté que les traces de mercure contenues dans le vaccin étaient sans danger. Je tombe alors sur des chroniques de journalistes habituellement rationnels se prononçant contre le vaccin faute d'être certain que le vaccin n'est pas dangereux. (Le manque de vaccin pourrait bien être un problème plus épineux. On verra bien. Mais si les réserves durent assez longtemps et qu'une fois les femmes enceintes, le personnel médical et les joueurs de hockey immunisés, il reste quelques doses pour les profs de mathématiques non enceints, je relèverai volontiers ma manche à mon tour. La fierté professionnelle m'oblige à me fier aux lois de la logique et de la probabilité.)

Au moment où j'écris ces lignes, il est difficile de savoir si le prochain ou les deux prochains mois se dérouleront normalement. Nos examens finals auront-ils lieu comme prévu avant Noël? D'ailleurs, nos universités seront-elles encore ouvertes? La Réunion d'hiver de la SMC à Windsor sera-t-elle aussi courue qu'à l'habitude? Espérons-le! Pour l'année qui vient, je vous souhaite de conserver la santé. Bonne chance!

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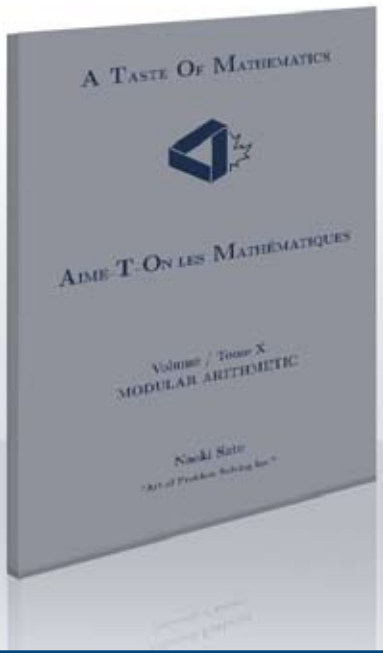

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A Concrete Approach to Classical Analysis

by Marian Mureşan, Canadian Mathematical Society books in Mathematics, Springer, 438 pp, 2009, $83.95 CDN, ISBN 978-0387789323

Reviewed by A.C. Thompson, Dalhousie University

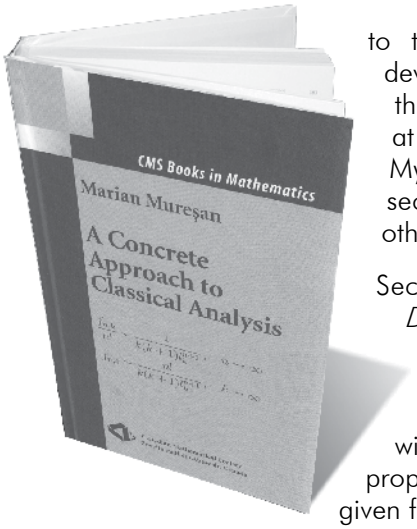
During my career as a mathematician, the approach to real analysis has gone through several incarnations. When I was an undergraduate more than fifty years ago (this is not the start of an academic Monty Python sketch although I am a Yorkshireman) G.H. Hardy's *A course of pure mathematics* still held sway as the definitive text serving as an introduction to real analysis. That book begins with the real numbers defined as Dedekind cuts of rational numbers and hence the completeness is proved as a theorem. Algebraic and order theoretic properties of the real numbers are also deduced from the definition of a Dedekind cut so that no axioms are explicitly stated. The only topology that creeps in is the Weierstrass theorem that bounded, infinite sets have limit points and the Heine-Borel covering theorem for closed, bounded intervals.

A few years later this approach was overwhelmed by the Bourbaki tide. The next generation of undergraduates was taught that the real number system is the unique (up to isomorphism) complete ordered field and, in addition, is a metric space. Continuity was defined via open sets and the topological notions of compactness and connectedness formed the basis for the properties of continuous functions. Over the years the starkness of this view was tempered gradually, with the introduction of more pictures, more examples and counter examples, but the basic philosophy remained fairly constant.

Mathematics itself (like the rest of life) has not remained constant. Those years have seen the computer change the way we do most things including the way we teach calculus. Is it time that it also changes the way we teach real analysis? The author would certainly answer 'yes' to this question. The present book is his answer to: "What should an easy comprehensible introduction to classical mathematical analysis look like?"

It is an ambitious book. In addition to the essential topics of limits of sequences and series, continuity, differentiation and integration, it includes a first section on set theory; a section introducing vector spaces, normed spaces and Hilbert spaces; and two, more unusual, final chapters headed *Constants and Asymptotic* and *combinatorial estimates*. More about these below. The book is clearly written. Although the use of English is somewhat idiosyncratic it does not obscure the meaning. It is reasonably free of misprints and typos.

Overall, however, I finished reading the book with a feeling of disappointment. I thought it did not live up



to the expectations I had developed. Let me explain this by a very detailed look at one particular section. My difficulties with this section extend to many others.

Section 4.4 is headed *Darboux functions*. A Darboux function was defined a few pages earlier as one with the intermediate value property but no motivation is given for making this definition. There are no exercises on Darboux functions except to show that if a Darboux function has an inverse then the inverse is also Darboux. However, one of the propositions in this section shows that if a Darboux function is one-one then it is both monotonic and continuous. The section ends with the surprising result of Sierpinski that *every* function from to $\mathbb{R}$ is the $\mathbb{R}$ sum of two Darboux functions. No proof of this result is given. There is no statement of its level of difficulty or how it might be approached. The reference for it at the end of the Chapter is to a book in Romanian (which is not very helpful to the average Canadian undergraduate). It is legitimate to leave unproved statements as "exercises for the reader" but here they range from elementary statements about sets (de Morgan's laws) and numbers (properties of absolute value) all the way up to Lindemann's theorem on the transcendence of π.

The constants in Chapter 9 are $\sqrt{2}$, π and e. The chapter includes a section on the arithmetic-geometric mean iteration method for the computation of π, a section on the Bailey, Borwein, Plouffe method for the computation of the nth binary digit of π and a section on Ramanujan formulas. These are extremely interesting results and may inspire an undergraduate with the power of analytic methods but I don't think they are part of "an easy comprehensible introduction to classical analysis". On the other hand, it is very nice to see the combinatorial results in Chapter 10 and the consequent asymptotic formulas. Students who have been in classes on combinatorics may be pleased to see the connections with real analysis.

Hardy's book was self-contained and could be given to an undergraduate to read without much supervision. This book is far from self-contained. It covers much more than could be covered in a year's course of analysis and would require very judicious use as a textbook. That said, it contains a great wealth of interesting material, some of it of very recent vintage. It is a very useful reference and every mathematician will find interesting results between its covers despite my reservations expressed above. The section on Darboux functions is a case in point.

Conformal Field Theory with Gauge Symmetry

by Kenji Ueno

Fields Institute Monograph, AMS, Providence, RI, 2008
168 pp. $63.74, ISBN 978-0821840887

Review by Terry Gannon, University of Alberta

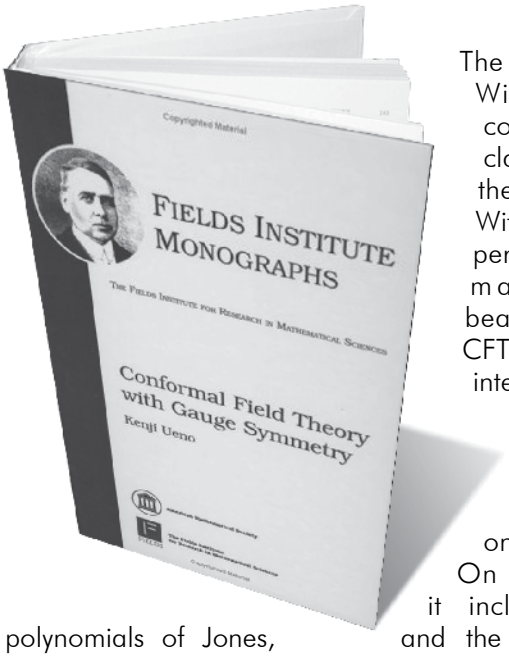
For much of the 20th century, developments in pure mathematics were largely independent of those in theoretical physics. But thanks largely to Atiyah, by the 1970s geometry had discovered *quantum field theory*, to very good effect.

Roughly speaking, quantum field theory tells us to study finite-dimensional objects using infinite-dimensional methods. But these physical theories are plagued with fundamental mathematical problems, so have largely been used heuristically. The Wightman axioms [SW] were proposed for making them mathematically sound, although in practice it is very difficult to realize nontrivial quantum field theories within that scheme.

By the late 1980s, mathematics had been introduced to string theory and in 1990 Ed Witten, its leading proponent, was awarded a Fields Medal. Strings are small oscillating circles or wavy arcs, which as they move through space trace out surfaces. On these surfaces is an induced quantum field theory called *conformal field theory* (CFT). CFT is a very special quantum field theory: its space-time has the smallest dimension possible (namely 2) for a nontrivial theory, and its space-time symmetry (conformal transformations) is the maximal possible. Its impact on mathematics in the past two decades has been unprecedented.

The mathematical riches of string theory arise through 'looping.' For instance, the diffeomorphism group Diff(S^1) of the loop (string) S^1 acts directly on all string theoretic quantities. Its Lie algebra – the Virasoro algebra – is the algebraic content of the conformal symmetry of CFT.

The *gauge group* (internal symmetry) of a typical quantum field theory is a compact Lie group G. Let $\mathfrak{g}$ denote the (reductive finite-dimensional) Lie algebra of G. In a string theory (or CFT) with gauge symmetry — usually called *Wess-Zumino-Witten models* — the gauge group is the loop group of some compact G, i.e. the set of maps $S^1 \to G$. The corresponding Lie algebra is the (infinite-dimensional) *affine Kac-Moody algebra* $\mathfrak{g}^{(1)}$ (see e.g. [K]). As interesting as $\mathfrak{g}$ is, $\mathfrak{g}^{(1)}$ is far more so. For instance, the characters of $\mathfrak{g}$ are trigonometric functions (e.g. the characters of $sl(2)$ are $\sin(nz)/\sin(z)$), and so live on a circle $\mathbb{R}/\mathbb{Z}$. The characters of the looped algebra $\mathfrak{g}^{(1)}$ live on loops over those circles, i.e. on tori $\mathbb{C}/(\mathbb{Z}+\tau\mathbb{Z})$, and the dependence on those tori, i.e. on the moduli τ, is nice. More precisely, the characters of the affine algebra $\mathfrak{g}^{(1)}$ are modular functions.



The Wess-Zumino-Witten models comprise a small class of CFT. But the Wess-Zumino-Witten models are perhaps the most mathematically beautiful of the CFTs, and are deeply intertwined with Lie theory.

The CFT of a string theory lives on every surface. On the sphere it includes the knot polynomials of Jones, and the vertex operator algebras of Borcherds. On the torus it includes monstrous moonshine and the aforementioned modularity of affine algebras. More precisely (if we believe the physics lore), to every surface a 'rational' CFT assigns a finite-dimensional vector space, called the space of *conformal blocks*. The dimension of this space is given by *Verlinde's formula*. Friedan-Shenker [FS] proposed to interpret each conformal block as a function over moduli spaces of surfaces. These blocks must behave in a special way (*factorization*) as we tend toward boundary points in moduli space (these correspond to surfaces with nodal singularities). Graeme Segal [S] proposed to rigorously define CFT by regarding it as a functor from the category of Riemann surfaces to the category of vector spaces. He never addressed the difficult question of existence. However, CFT in the punctured plane has been well-understood for some time now: there the Wightman axioms lead directly to the notion of a vertex operator algebra (see e.g. [FB]).

These conformal blocks are solutions to a differential equation called the Kniznik-Zamolodchikov equation, arising from the conformal symmetry (i.e. the action of Diff(S^1) on the moduli spaces). The monodromy picked up by these solutions as you run around singular points in moduli space yield representations of the surface mapping class groups. For example, the mapping class group for the torus is the modular group SL(2; $\mathbb{Z}$), and the moduli space of tori is the quotient of the upper half of the complex plane by that group; for a CFT with gauge symmetry, the conformal blocks for the torus are characters of the appropriate affine algebra, explaining the modularity of those characters. Likewise, the mapping class groups in genus 0 are essentially the braid groups, which explains the relation to knots.

Strictly speaking, this description applies to *rational* CFT – rationality is to CFT what semi-simplicity is to Lie algebras. There are (more subtle) classes of non-rational

CFT (e.g. the logarithmic ones) which are also interesting mathematically. Moreover, all this concerns the square-root (usually called a *chiral half*) of CFT: the P quantities (*correlation functions*) of physical interest in a CFT are sesquilinear combinations $\sum_i f_i \bar{g}_i$ of conformal blocks f_i; g_i, invariant under the action of the mapping class group. This *full* CFT is also of mathematical interest. For example the full CFTs associated to affine algebra $sl(2)^{(1)}$ fall into an A-D-E pattern [CIZ], while those associated to $sl(3)^{(1)}$ are related to Jacobians of Fermat curves [BCIR]. Deep connections to subfactor theory (see e.g. [EK]) involve the full CFT, and there is a striking categorical interpretation of correlation functions (see e.g. [SFR]).

[TUY] (see also [T], [U2] and the book [U1] under review) specialize exclusively to the chiral halves of Wess-Zumino-Witten CFTs, and give an explicit and rigorous description of all relevant quantities in the Friedan-Shenker formalism. They construct the conformal blocks associated to any surface (including those with nodes), obtain the Kniznik-Zamolodchikov equations and show that their monodromy gives (projective) representations of the mapping class groups. In [U2], the formalism is used to prove Verlinde's formula. In [AU], the formalism of [TUY] is shown to yield Segal's functor. This series of papers constitutes a fundamental and deep contribution to the mathematics of CFT, more specifically the Wess-Zumino-Witten models. It supplies the first rigorous construction of a CFT in arbitrary genus, and thus a proof that the formalism of e.g. Segal is not vacuous.

Although this work of Ueno et al is undeniably important, it is not the end of the story. It concerns only the Wess-Zumino-Witten models, and in fact only their chiral halves. In the years since [TUY], there have been several partial generalizations, looking at much broader classes of CFT. A very general construction of Segal's functor, associated to any sufficiently reasonable rational vertex operator algebra, is being developed by Huang (see e.g. [H]), but his work is at present only complete in genus 0 and 1. Beilinson-Drinfeld [BD] avoid the explicit coordinates polluting [TUY] and the theory of vertex operator algebras, at some expense (D-modules); their elegant theory of 'chiral algebras' makes sense in arbitrary genus, and [FB] have associated chiral algebras to any vertex operator algebra (although some aspects of the CFT story, e.g. surfaces with nodes, have not been realized yet in full generality).

The book [U1] systematically collects the theory developed in that series of papers by Ueno et al. Chapter 1 is a review of Riemann surfaces with nodes – surfaces with singularities are needed to prove factorization and Verlinde's formula. Chapter 2 reviews affine Kac-Moody algebras and their representations – the algebraic content of the 'gauge symmetries'. Chapter 3 associates conformal blocks to each surface with nodes, and Chapter 4 (locally) develops their moduli space interpretation. Both of these chapters largely follow [TUY], but after this Ueno leaves [TUY]. Chapter 5 shows that the construction of Chapter 4 supports a projectively flat connection — this is the essence of the Kniznik-Zamolodchikov equation and the mapping class group action mentioned earlier. He goes on to prove the Verlinde formula. Chapter 6 specializes to the sphere. He shows that the classical Kniznik-Zamolodchikov equations are recovered, and when the gauge symmetry is $sl(n)^{(1)}$ he relates this mapping class group representation to a Hecke algebra representation found previously by Wenzl.

The book is clearly and carefully written by a master of the subject. However it is not at all a gentle introduction to CFT, and assumes sophistication with algebraic geometry (although it makes an effort to be self-contained). This sophistication is unavoidable, given the nature of the subject – indeed in other books the author has demonstrated his pedagogical flare. A more elementary introduction to CFT, though thick with physics, is [DMS]. A more elementary introduction to much of the material covered in [U1] and this review, including CFT, is provided in [G].

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BRIEF BOOK REVIEWS

by Srinivasa Swaminathan
Dalhousie University, Halifax

Complex Dynamics, Families and Friends

Edited by Dierk Schleicher
xx + 635 pp, A. K. Peters, Ltd 2009

This is a book on the mathematical theory of the dynamics of iterated holomorphic maps in one or several complex variables. Families of iterated maps are considered. The book is dedicated to John Hamal Hubbard, one of the pioneers in this field; he is reported to have often exclaimed during presentations: "this map is an old friend of mine". It is in this sense that this book is about families and friends in complex dynamics.

The book consists of contributions by many leading mathematicians in the field, such as Mikhail Lyubich, John Milnor, Mitsuhiro Shishikura, and William Thurston. Some of the chapters, including an introduction by Thurston to the general subject of complex dynamics, are classic manuscripts not published before but have influenced the field for the past two decades. The papers are organized in four parts entitled: Polynomial Dynamics from Combinatorics to Topology, Beyond Polynomials: Rational and Transcendental Dynamics, Two Complex Dimensions, and Making New Friends.

Elliptic Partial Differential Equations and Quasiconformal Mappings in the Plane

By Kari Astala, Tadeusz Iwaniec and Gaven Martin
Princeton Mathematical Series 48
xvi + 677 pp, Princeton 2009

This book explores the recent developments in the theory of planar quasiconformal mappings with a particular focus on the interactions with partial differential equations and nonlinear analysis. There are profound applications in such wide ranging areas as holomorphic dynamical systems, singular integral operators, inverse problems, geometry of maps, and more generally, calculus of variations – all of these are presented in the book. The theory of quasiconformal mappings and their applications in complex analysis is discussed in the first few chapters. There is a chapter entitled 'complex potentials' which presents a good self-contained introduction to harmonic analysis and the theory of singular integral operators in two dimensions. The later chapters are devoted to recent advances in special areas such as Beltrami equations and operators, and aspects of calculus of variations. The book will be useful to research mathematicians looking for powerful modern techniques in diverse applications.

The Wraparound Universe

By Jean-Pierre Luminet
xii + 316 pp, A. K. Peters 2007

The aim of this book is to describe a particular approach to cosmology, known as cosmic topology, that seeks to discover the overall size and shape of the universe, one of the biggest questions in cosmology for more than 25 centuries. The author is an astrophysicist and a leading expert on black holes, cosmology and cosmic topology. He has published many research articles, popular books, novels and books of poetry in French. The central question addressed in this book is whether it is possible that the universe wraps around itself in an interesting way, as well as the impact this could have on astronomical observations and our understanding of cosmology. In a wraparound universe, the size of space can be smaller than the observed universe, so that a fraction of distant galaxies could be just multiple images of closer galaxies. Discussing this fascinating theory, Luminet reviews promising techniques for discerning these strange properties of space that will be used in the coming decades. The text is divided into two parts entitled 'The shape of space' and 'Folds in the Universe'. Each part contains 23 short chapters. Explanations are given for the relevant mathematical concepts, general relativity, big bang models and cosmic topology.

BOOK REVIEW *continued*

[S] G. Segal, 'The definition of conformal field theory', *Topology, Geometry and Quantum Field Theory (Oxford, 2002)* (Cambridge University Press, Cambridge 2004) 423–577.
[SW] R. F. Streater and A. S. Wightman, *PCT, Spin and Statistics, and All That* (Princeton University Press, Princeton 1989).
[T] A. Tsuchiya, 'Moduli of stable curves, conformal field theory and affine Lie algebras', *Proc. Intl. Congr. Math. (Kyoto, 1990)* 1409–1419.
[TUY] A. Tsuchiya, K. Ueno, and Y. Yamada, 'Conformal field theory on universal family of stable curves with gauge symmetries', *Integrable Systems in Quantum Field Theory and Statistical Mechanics*, Adv. Stud. Pure Math. 19 (Academic Press, Boston 1989) 459–566.
[U1] K. Ueno, *Conformal Field Theory with Gauge Symmetry*, Fields Institute Monographs (American Mathematical Society, Providence 2008).
[U2] K. Ueno, 'On conformal field theory', *London Math. Soc. Lecture Note* 208 (1995) 283–345.

by Ed Barbeau
University of Toronto, Ontario

A change of editorship

This is the last issue for which I edit the *Education Notes*, a section of the *CMS Notes* that began in earnest under Katherine Heinrich (as far as I can tell) about twenty years ago, and for which I have been responsible for the last ten. Over the years, there have been many guest articles, reports on conferences, books and pedagogical initiatives at many institutions, notices of teaching awards, and discussions of issues. Despite a brief foray into French under the co-editorship of Harry White, unfortunately we were unable to make items in French a permanent part of the column. I have made a list of contents of education items in all of the issues of the *Notes* since 1992, which I will be happy to send out; please contact me at *barbeau@math.utoronto.ca*.

I am very pleased that John Grant McLoughlin and Jennifer Hyndman have agreed to continue the column for at least the next three years. Both of them are well connected into the mathematics educational community and have plans for important and interesting items to appear. At the end of this column, they will introduce themselves to you; I encourage you to send them news of awards and initiatives at your institution, comments on issues, and anything that you think will be of interest to the members of the Society.

It is over forty-five years since I received my doctorate and accepted my first academic appointment. The changes that have taken place since I was in secondary school have been remarkable. Many have been extremely positive, but their effectiveness has been attenuated by a loss of cohesion in the educational system as a whole so that not everyone has benefited from these changes.

On the positive side, we have a much better understanding of how students understand or fail to understand mathematical ideas; individual teachers at every level have successfully created environments which help students better learn and use mathematics. At best, there are opportunities for secondary and tertiary students to do original work and present results of their investigations at meetings through lectures and posters or in magazines; the Canadian Mathematical Society, in particular, has a major educational thrust that did not exist forty years ago.

However, as we all know, there has been much dissatisfaction with the educational system as a whole and with the preparedness of students. Many of them seem to lack an appreciation of the most basic conventions, concepts and techniques of mathematics. Indeed, the most marked difference I can see between then – a half century ago – and now, is the widening gap between the best and the worst, whether we are talking about teachers, students or textual materials.

There are a number of reasons for this. One is surely the much greater diversity in our communities with respect to both cultural background and living circumstances. Formerly, it was much easier to have a social consensus about what education was for, what should be on the syllabus, what type of teaching and testing was appropriate and what the standards of discipline were; social and language problems did not intrude into the schools to anything like the extent that they do now. While this might have made for a more bland system, it did give the basic stability which allowed it to operate at an acceptable level. Modern teachers often have to contend with violence, cheating and poverty to a level that can frustrate their work and the ability of pupils to learn.

A second reason is the push for universal education to an advanced level, coupled with a weakening of the gate keeping that keeps students out of programs for which they are inadequately prepared. In the 1940s and 1950s, a pupil could leave school at sixteen, or even fourteen, and hope to find a job that would have future prospects. Now, many jobs require a college degree for entry for which a grade 10 or grade 12 certificate would formerly have sufficed, even though it may be hard to discern what the college experience is expected to contribute. While the effort to keep children in school helps avoid the casualties of an earlier era, who had to leave school for spurious or technical reasons rather than lack of ability, the modern secondary and university teacher is often faced with a class whose range of competence and understanding presents a major challenge and there is pressure to remove from the syllabus the depth that seems essential if one is to achieve mathematical fluency and comprehension.

A third reason is the qualifications of teachers. It seems to me that when I was a child, the methods adopted for teaching arithmetic in elementary school were pretty cut and dried, so that most teachers managed to cope quite well. This is not to say that it was particularly satisfactory nor that there were no children scarred by the experience. Certainly, the time was ripe for improvements. However, improvements in pedagogy can be effected only when the teachers have the necessary experience and knowledge to appreciate their import, and it is in this area of professional development that we seem to have fallen down and where faculties of education have been making amends. At the secondary level, there is a different difficulty. My fairly standard high school of about 600 students had five mathematics teachers, three of whom

were honours graduates in the subject, one was a "type B" generalist teacher and the remaining one was the music head (who was actually a pretty good teacher). It is difficult to get honours mathematics graduates into the classroom these days, and to keep the few who opt for teaching. There are many teachers with a minimal background in mathematics.

As an old-timer, my abiding impression of the current education system at all levels is how much pressure there is on everyone, both pupils and teachers. Some of this pressure is politically generated in the name of accountability; some of it is the pressure of sometimes not very well-defined or agreed-upon expectations; some of it is the pressure of lack of resources; some of it is the pressure of balancing priorities effectively. This surely does not provide a good environment for learning.

Despite all of the innovation and the productivity of educational research, despite the fact that there are many students whose educational experience, knowledge and capabilities are beyond the best of a half century ago, we need to face up to the fact that educational reform has to go beyond technical fixes, rejigging the syllabus or changing the teaching regime in the classroom. Serious problems afflict the system as a whole, the values and goals that are held, the degree to which curiosity and intellectual growth are at odds with the most conspicuous aspects of our way of life. If we want to study why some jurisdictions are performing better than others, now or in the past, we should be looking at the ideological landscape, at what is regarded the key to human happiness and satisfaction, and why.

Transitioning with the Education Notes

J. Grant McLoughlin & J. Hyndman

Ed Barbeau has edited the *Education Notes* for ten years. It is a privilege to be invited to edit the *Education Notes* and assume the responsibility (from 2010 through 2012) on behalf of the CMS community. We wish to take this opportunity to thank Ed for his service and support to us in this transitional phase. Here we introduce ourselves as co-editors. The intent of this introduction is twofold: offering insight into our backgrounds and inviting you to share your stories.

John Grant McLoughlin is a Professor of Mathematics Education at the University of New Brunswick with a cross-appointment to the Department of Mathematics and Statistics. Most of John's teaching involves work with elementary teachers – both preservice and in-service. His interests include biography, mathematical problem solving and problem posing, recreational mathematics, outreach, and teaching and learning across disciplines. John has taught in British Columbia, Ontario, and Newfoundland and Labrador prior to his appointment at UNB in 2002.

Jennifer Hyndman had the privilege of being a founding faculty member of the University of Northern British Columbia in 1994 and is now Professor of Mathematics and Chair of the Mathematics Program at UNBC. Jennifer prefers to think of her teaching as algebraic performance art. Her courses cover the gamut of precalculus through graduate field theory. She does research on natural duality theory, lattice theory, finite axiomatizability, and mathematical learning.

The *Education Notes* provide a forum to share stories of outreach, teaching, and educational activities with the broader community. Perhaps there is a talk (by you or someone else); a local initiative with its own history that is not well known to others; the efforts of your department or a local school concerning mathematics and education; or a forthcoming event of interest to a broader community. We want to make these activities known to a wider audience.

Forthcoming features include working group reports from the recent *Canadian Mathematics Education Forum*, two talks – one on community outreach and another on teaching undergraduate mathematics, a story of working with teachers in an international context, and other materials to be gathered from the community at large. Indeed, we look forward to seeing what emerges from the contributions. Please communicate your ideas to John Grant McLoughlin *johngm@unb.ca* or Jennifer Hyndman *hyndman@unbc.ca*.

WANTED: Books for Review
RECHERCHÉS : Livres pour critiques littéraires

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

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

Keith Johnson, Department of Mathematics and Statistics, Dalhousie University, Halifax NS B3H 3J5

REPORT ON THE 49TH INTERNATIONAL MATH OLYMPIAD

Chen Sun (A.B. Lucas Secondary School)
2009 Samuel Beatty Contestant

The International Mathematical Olympiad (IMO) is the most prestigious high school mathematics competition in the world. Held annually in a different location each year, each country sends a team of at most 6 secondary students to write a contest over two days. Each day of the contest, the contestants are presented with three essay-style problems to be solved in 4.5 hrs, for a total of 9 hrs. These problems are frequently in the style of "mini" mathematics research problems, requiring clever and novel arguments and ideas. This year the 50th IMO, held in the port city of Bremen, Germany, was also the largest IMO to date, with over hundred countries participating and 600 contestants.

Each country decides who they are going to send to the IMO. The Canadian team is traditionally chosen in mid-May based on the results of three other Olympiads similar to the IMO: the Asian-Pacific Mathematical Olympiad (APMO), the United States of America Mathematical Olympiad (USAMO), and our own Canadian Mathematical Olympiad (CMO). Our team was exceptionally talented, with four out of the six of us having previously attended IMO 2008 in Madrid, Spain.

Before we headed to the IMO site in Germany, we spent two weeks at the Banff International Research Station (BIRS) in the Rockies. In that gorgeous environment, we trained very hard for the upcoming IMO. Through the course of our training, previous Canadian IMO medalists and university professors gave us plenty of lectures, problems and mock contests for practice.

Officially, eight hours per day at the training camp are spent doing math, with a mock Olympiad or lecture in the morning, another lecture in the afternoon, and a problem session in the evening. However, in actual fact, most of our team spent a large portion of our free time working on problems too, with several members working through recreational time, excursions, and even meals!

Our accommodations at Banff were excellent. The campus allowed us internet access and even free access to the gym. (While taking breaks from math, members of our team often went to play basketball). The meals were also fantastic — we ate almost every day at a classy buffet-style establishment in view of the mountains. We also had several excursions, including ones to the Banff Canada Day Parade, to Lake Louise, and the natural "inkpot" basins.

After the second week, we finally headed to the IMO site in Germany. We arrived two days before the actual competition date to adjust to jetlag.

The day before the contest, the IMO officially started with the Opening Ceremony. Angela Merkel, the Chancellor of Germany, delivered a speech. Because it was the 50th anniversary of the IMO, the Germans decided to nostalgically show us when each of the 100 international countries started participating, by a Countries' Parade in order by year. Romania and 4 other Eastern European Teams were the first participating countries in 1959. After the Opening Ceremony, we had a nice lunch outside, where we went around and met the other teams. We spent the rest of the day relaxing, in anticipation of the contest the next day. The Germans, in the evening announced something — that in honor of the 50th anniversary, all the medals this year would be made of the actual substances — the gold medals would be made of actual gold, the silver, silver, and the bronze, bronze. This was both exciting and unnerving for us as participants!

The next morning, we woke up early and ate (or tried to eat) a good breakfast, nervous about the upcoming contest. We forgot about our anxiety, though, when we received the problems and started devoting all our energy towards solving them. Problem 1 was a fairly easy number theory problem, meant to get contestants comfortable with the paper. Problem 2 was a nice problem from Euclidean Geometry. Nearly the entire Canadian team was able to solve the problem, and nearly every single one of us produced *different* solutions! Problem 3, the hardest problem of the contest that day, was to prove a certain number theoretic sequential result. The solution was deceptively short, but only one member of our team found it.

The same process repeated the next day. Problem 4 was a problem in Euclidean Geometry again, but this year, it was actually rather tricky for a first problem! Although the Canadian team did fairly well on it, while asking our friends from other countries, some of them were not so successful. Problem 5 was an interesting functional equations problem. Again, our Team, solid from the two week training period in Banff, was able to do very well on it. Finally, Problem 6 was the last problem of the day and the hardest problem of the

entire contest, a very hard combinatorics problem. In total, only 3 out of some 600 contestants were able to solve it, making it one of the hardest problems in IMO history. None of the Canadian team were able to make significant progress on it. (For those interested, the contest in 52 different languages, information about the city of Bremen, and greetings are available at www.imo-official.org/year_info.aspx?year=2009, the official IMO 2009 website.)

After the contest was over, we could finally relax. Over the next few days, while our Team Leader and Deputy Leader would be discussing and arguing for our solutions with the problem coordinators, the organizers showed us the sights of Bremen. Among other places, we visited the Bremen City, and got to know the legend of the "Musicians of Bremen" very well. We also went to the beautiful island of Wangerooge and the Wadden Sea World Heritage Site where we had a scavenger hunt across the island and the beach. There were also lots of fun events organized, including a rock concert, a soccer tournament, and several banquets. There was also a special session where past IMO participants who had become famous mathematicians came to talk with us. A lot of Canadians were very excited when Terence Tao, the Fields Medal winner, also came! We also spent much time with the other teams, especially the Americans and the Australians and the Indians.

Eventually all the scores were decided on and we got to see our medal standings. In the IMO, half the contestants get medals, and the numbers of gold, silver, and bronze medals are roughly in the proportion 1:2:3. Our team received gold, 3 silvers and two bronzes; making it the 4th time in history everyone on Team Canada received a medal. Moreover, we placed 18th in the unofficial country rankings, one of the best performances in Canadian history! We were all very happy with our performance. We received our medals at the Closing Ceremony that evening and were treated to a farewell barbeque afterwards. We flew back to Canada the next day.

Despite being a lot of work, being a member of the Canadian IMO team has been one of the most enjoyable experiences of my high-school career. This would not be possible without the support of the Canadian Mathematical Society and sponsors like the Samuel Beatty Fund. Also, thanks go to the leaders, coaches, and teachers who helped us succeed to the extent which we did.

Graham Wright Award for Distinguished Service
Prix Graham-Wright pour service méritoire

2010

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, 2010**, to the address below.

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 2010** au plus tard, à l'adresse ci-dessous :

Selection Committee / Comité de sélection
Graham Wright Award for Distinguished Service / Prix Graham-Wright pour service méritoire
Canadian Mathematical Society / Société mathématique du Canada
105-1785 Alta Vista Drive
Ottawa, ON K1G 3Y6 Canada

Reddition de comptes

Au moment d'écrire cet article à la mi-octobre, je suis, comme bon nombre de nos collègues, au beau milieu du processus de demandes de subventions pour appuyer les programmes et projets de recherche continus – mes confrères et consœurs spécialistes des sciences mathématiques soumettent des demandes de financement auprès d'un grand éventail de sources, dont les organismes fédéraux des trois Conseils que sont les Instituts de recherche en santé du Canada, le Conseil de recherches en sciences naturelles et en génie (CRSNG) et le Conseil de recherches en sciences humaines, différents organismes provinciaux, les Réseaux de centres d'excellence comme le Réseau MITACS, les instituts de mathématiques par l'entremise de leur soutien accordé aux programmes, les commanditaires industriels, dont des sociétés canadiennes et des entreprises à but non lucratif ainsi que bien d'autres.

Tous ces gouvernements, établissements, entreprises et organismes de financement exigent des chercheurs qu'ils rendent compte des progrès réalisés et qu'ils conçoivent des plans bien élaborés concernant leurs projets. Temps, argent et efforts sont investis dans ces initiatives de recherche, qu'elles soient de petite ou de grande taille, et les commanditaires tiennent les chercheurs responsables des dépenses de ces ressources limitées afin de veiller au succès de leurs missions. Voilà comment cela devrait fonctionner.

Une grande partie de la profession mathématique s'articule autour de la reddition de comptes. Lorsque nous soumettons un article scientifique pour publication ou présentons un exposé lors d'une conférence, nous affirmons que le travail présenté est exact, nouveau et de notre cru, sinon l'auteur sera correctement cité. Les examinateurs et les rédacteurs en chef de périodiques qui examinent notre travail nous imposent certaines normes que nous devons respecter afin que notre travail soit exact, novateur propre à nous. Lorsque nous enseignons, on s'attend à ce que nous présentions efficacement des renseignements exacts et à jour qui permettent aux étudiants d'apprendre. Auprès de nos étudiants aux cycles supérieurs, nous devons investir beaucoup d'efforts sur le plan de la recherche et leur fournir les dernières informations. Nous devons répondre à certaines normes de qualité lorsque nous enseignons puisque notre travail est examiné minutieusement par nos pairs, les directeurs de département, les doyens ainsi que par les étudiants, qui n'hésitent pas à sonner l'alarme si la qualité de l'enseignement diminue. Nous promouvons encore dàvantage la reddition de comptes au sein de la profession lorsque nous rédigeons des lettres de recommandation pour des collègues et des étudiants, effectuons des examens en vue de l'attribution d'un poste permanent, évaluons des demandes de bourses d'études et même lorsque nous notons les étudiants. C'est dans ces situations que nous imposons aux collègues et aux étudiants (collègues en formation) certaines normes afin de veiller à la qualité de notre communauté dans son ensemble.

Bizarrement, il n'existe aucun « Hippocratic oath » sérieux pour les spécialistes des sciences mathématiques, avec une déclaration explicite des principes d'excellence et de responsabilité épousés par notre communauté. (Même si j'ai déjà vu une version moins sérieuse qui commençait par « By this Math Oath, I swear to at least try not to be an Oaf... ») Il est également bizarre que nous n'enseignions pas explicitement la reddition de comptes à nos étudiants, mais que nous nous attendions plutôt à ce qu'ils l'apprennent simplement de nous, comme si cela se faisait par osmose.

Mon objectif est ici de montrer que nous ne sommes pas les seuls à devoir rendre des comptes. Une des tâches de la communauté de professionnels est de demander des comptes à ces organismes qui fournissent l'environnement et les ressources nécessaires pour réussir à atteindre notre propre mission en tant que spécialistes des sciences mathématiques. Par exemple, au sein d'une université, ce sont l'administration et le Conseil des gouverneurs qui établissent les conditions globales contribuant ou non au succès de notre enseignement, de notre recherche et de la prestation de services offerts à la population. Les divers organismes de financement mettent sur pied les programmes et les initiatives de financement qui appuient ou non nos buts et priorités en tant que communauté de professionnels. En cernant les priorités pour le pays, les gouvernements fédéral et provinciaux influent aussi directement sur le travail que nous sommes en mesure d'accomplir en tant que professionnels.

Il importe de discuter avec les administrateurs, les organismes de financement ainsi que les autres organismes qui définissent notre milieu de travail afin que nous disposions des ressources nécessaires pour accomplir ce qui nous est demandé sur le plan de la création, de l'application et de la diffusion du savoir dans le domaine des sciences mathématiques. En l'occurrence, nous les tenons responsables de définir les conditions dans lesquelles nous travaillons tout comme nous sommes responsables de notre propre travail.

Au cours des 10 à 15 dernières années, la communauté mathématique a reconnu que nous pouvions, en tant que groupe, cerner explicitement ce dont nous avions besoin pour accomplir notre travail et collaborer avec les gouvernements, les administrateurs, les entreprises et les organismes de financement afin d'atteindre nos objectifs communs. Par exemple, la communauté mathématique a cerné le besoin de mettre sur pied des instituts nationaux comme le CRM, l'Institut Fields, le PIMS et l'AARMA, de fonder des centres internationaux comme la SRIB et de créer des initiatives dans le secteur privé et dans le domaine de la santé comme le Réseau MITACS et le PNSDC, pour réaliser nos aspirations en tant que chercheurs et pédagogues. En collaborant avec notre gouvernement et nos partenaires de financement, nous sommes parvenus à démontrer que les

découvertes de « grands projets scientifiques » n'ont pas été exclusivement réalisées grâce à de l'équipement d'envergure comme des accélérateurs de particules, des télescopes massifs, des énormes laboratoires, mais aussi grâce à de « grandes initiatives » comme nos instituts et réseaux pour les sciences mathématiques.

C'est une tâche qui n'est jamais achevée. En raison des changements apportés au sein des universités, du CRSNG et d'autres organismes de financement à la suite des nouvelles priorités établies par les gouvernements, les conseils des gouverneurs et la direction scientifique du pays, demandez-vous de quelle manière ces changements influeront sur notre communauté de spécialistes des sciences mathématiques? Il est essentiel que vous vous entreteniez avec vos collègues, cherchiez des moyens efficaces de réagir à ces changements et discutiez avec les gouvernements, les administrateurs et les organismes de financement afin de veiller à ce que ces nouvelles priorités tiennent également compte des objectifs de notre communauté.

La fin de semaine dernière, les dirigeants des instituts, réseaux et sociétés professionnelles de la communauté mathématique se sont réunis à Banff pour discuter des difficultés et des occasions qui se présentent dans cet environnement en constante évolution de priorités et de plans établis par les gouvernements, les organismes de financement, les universités et notre propre communauté. Nous avons bien hâte de connaître vos idées, préoccupations et plans d'action en ce qui concerne la communauté mondiale des spécialistes des sciences mathématiques.

CALL FOR SITES
DEMANDES DE PROPOSITIONS D'EMPLACEMENTS

Interested in hosting a CMS Meeting?
The CMS Research Committee invites proposals from heads of departments interested in hosting a CMS Meeting. The winter meeting sites are confirmed to December 2010, the summer meeting sites are confirmed to June 2012.

Vous aimeriez accueillir une Réunion de la SMC?
Le Comité de la recherche de la SMC lance un appel de propositions aux chefs de départements intéressés à accueillir une Réunion de la SMC. Les hôtes des Réunions d'hiver sont confirmés jusqu'en décembre 2010, et ceux des Réunions d'été, jusqu'en juin 2012.

Dr. Edward Bierstone, Chair
CMS Research Committee / Comité de recherches de la SMC
Department of Mathematics, University of Toronto
100 St. George Street, Toronto, Ontario M5S 3G3

香港城市大學
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Applications are invited for:

Associate Professor/Assistant Professor
Department of Mathematics *[Ref. A/584/59]*

Duties : Conduct research in areas of Applied Mathematics, teach undergraduate and postgraduate courses, supervise research students, and perform any other duties as assigned.

Requirements : A PhD in Mathematics/Applied Mathematics/Statistics with an excellent research record.

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Remuneration package will be very attractive, driven by market competitiveness and individual performance. Excellent fringe benefits include gratuity, leave, medical and dental schemes, and relocation assistance (where applicable). Initial appointment will be made on a fixed-term contract.

Information and Application
Further information on the posts and the University is available at http://www.cityu.edu.hk, or from the Human Resources Office, City University of Hong Kong, Tat Chee Avenue, Kowloon, Hong Kong [Fax : (852) 2788 1154 or (852) 3442 0311/email: hrojob@cityu.edu.hk]. Please send the application with a current curriculum vitae to Human Resources Office. **Applications will be considered until positions are filled.** Please quote the reference of the post in the application and on the envelope. The University reserves the right to consider late applications, and not to fill the positions. Personal data provided by applicants will be used for recruitment and other employment-related purposes.

June 4 - 6, 2010
University of New Brunswick (Fredricton)

Meeting Directors / Directeurs de la Réunion :

Dr. Hugh Thomas
hthomas@unb.ca, T. 506-458-7331
Dr. Barry Monson
bmonson@unb.ca, T. 506-453-4768

Local Arrangements / Logistique locale

Dr. Maureen Tingley
tingleym@unb.ca, T. 506-458-7343

Plenary Lectures / Conférences plénières

Gerda de Vries (Alberta)
Idun Reiten (Norwegian Univ. of Science and Technology)
Gunther Uhlmann (Washington)
Henri Moscovici (Ohio State)
Kristin Schleich (UBC)

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

Algebraic Combinatorics
Combinatoire algèbrique
Org: Li Li, Alex Yong (Illinois - Urbana-Champaign)

Algebraic Geometry, Non-commutative Algebra and Derived Categories
Géométrie algébrique, algèbre non commutative et catégories dérivées
Org: Colin Ingalls (UNB)

Discrete Geometry
Géométrie discrète
Org: Barry Monson (UNB), Egon Schulte (Northeastern)

Error Control Codes, Information Theory, and Applied Cryptography
Codes de contrôle d'erreurs, théorie de l'information et cryptographie appliquée
Org: Tim Alderson (UNB - Saint John)

Geometric and Combinatorial Aspects of Convex Optimization
Aspects géométriques et combinatoires de l'optimisation convexe
Org: David Bremner (UNB)

Geometric Topology
Topologie géométrique
Org: Ryan Budney (Victoria), Andy Nicas (McMaster)

Graph Theory
Théorie des graphes
Org: Shannon Fitzpatrick (UPEI)

Inverse Problems in Partial Differential Equations
Problèmes inverses pour les équations aux dérivées partielles
Org: Adrian Nachman (Toronto)

Mathematical Ecology and Epidemiology
Ecologie mathématique et épidémiologie
Org: Lin Wang, James Watmough (UNB)

Mathematical Physics
Physique mathématique
Org: Jack Gegenberg, Viqar Husain (UNB)

Mathematics Education
Éducation mathématique
Org: Alyssa Sankey (UNB)

Noncommutative Geometry
Géométrie non commutative
Org: Bahram Rangipour (UNB)

Representation Theory of Algebras
Théorie des représentations des algèbres
Org: Ibrahim Assem (Sherbrooke), Thomas Brüstle (Sherbrooke; Bishop's), Shiping Liu (Sherbrooke)

Spectral Methods in the Analysis of Differential Equations
Méthodes spectrales en analyse des équations différentielles
Org: Almut Burchard, Marina Chugunova (Toronto)

Stability in Nonlinear Partial Differential Equations
Stabilité pour les équations aux dérivées partielles nonlinéaires
Org: Stephen Gustafson (UBC); Dmitry Pelinovsky (McMaster)

Tensor Categories
Catégories tensorielles
Org: Robert Paré (Dalhousie)

Contributed Papers
Communications libres
Org: TBD

CALL FOR SESSIONS

We welcome and invite proposals for sessions for this meeting in Vancouver, British Columbia (December 4-6, 2010). 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, e-mail address, etc. 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: January 31, 2010

APPEL DE SESSIONS

Nous vous invitons à proposer des sessions pour la réunion qui se tiendra à Vancouver (Colombie-Britannique) du 4 au 6 décembre 2010. 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, l'adresse courriel et les autres coordonnées de l'organisateur. Toutes les sessions seront annoncées dans les Notes de la SMC, sur le site web et dans le Notices de l'AMS. 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 limite indiquée ci-dessous.

Date limite : 31 janvier 2010

Scientific Directors / Directeurs scientifiques :

Dr. Brian Marcus (UBC)
marcus@math.ubc.ca, T:604-822-3262

Dr. Jozsef Solymosi (UBC)
solymosi@math.ubc.ca, T: 604-822-5868

Plenary Lectures / Conférences plénières

David Aldous (UC-Berkeley)
Sujatha Ramdorai (Tata Institute; UBC)
Peter Sarnak (Princeton)
Tamar Ziegler (Technion)

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

Compressed Sensing: Theory, Algorithms and Application
Acquisition comprimée : Théorie, algorithmes et application
Org: Michael Friedlander (UBC), Felix Herrmann (UBC), Ozgur Yilmaz (UBC)

Computational Number Theory
Théorie des nombres computationnelle
Org: Mark Bauer (Calgary), Mike Bennett (UBC)

Convex and Nonsmooth Analysis
Analyse convexe et non lisse
Org: Philip Loewen (UBC), Yves Lucet (UBC-Okanagan)

Harmonic Analysis and Additive Combinatorics
Analyse harmonique et combinatoires additives
Org: Izabella Laba (UBC), Akos Magyar (UBC), Malabika Pramanik (UBC)

History and Philosophy of Mathematics
Histoire et philosophie des mathématiques
Org: Tom Archibald (SFU), Alan Richarson (UBC), Glen van Brummelen (Quest Univ.)

Mathematics Education
Éducation mathématique
Org: TBD

p-adic groups, Automorphic forms, and Geometry
Groupes p-adiques, formes automorphes et géométrie
Org: Clifton Cunningham (Calgary), Julia Gordon (UBC)

Probability in Biology and Computer Science
Probabilité en biologie et informatique
Org: David Brydges (UBC), Ed Perkins (UBC)

Symbolic Dynamics and Ergodic Theory
Dynamique symbolique et théorie ergodique
Org: Chris Bose (Victoria), Doug Lind (Washington), Ian Putnam (Victoria), Anthony Quas (Victoria)

Theory and Application of Sequences and Arrays
Théorie et application des suites et tableaux
Org: Jonathan Jedwab (SFU), Brett Stevens (Carleton)

Contributed Papers
Communications libres
Org: TBD

UNIVERSITY OF TORONTO

Assistant Professor

Position ID: UofT-UTSC
Position Title: Assistant Professor
Position Location: Toronto, Ontario M5S 2E4, Canada
Subject Areas: Algebra, Number theory, Analysis, Geometry
Application Deadline: 2010/01/17 (posted 2009/11/09, listed until 2010/01/17)
Position Description: Apply

The Department of Computer and Mathematical Sciences, University of Toronto Scarborough, and the graduate Department of Mathematics, University of Toronto invite applications for a tenure-stream appointment at the rank of Assistant Professor, with an expected start date of July 1, 2010.

Candidates with research expertise in algebra, number theory, analysis or geometry will be given preference. The successful candidate will be expected to participate actively in the Graduate Department of Mathematics as well as contribute to the enrichment of mathematics academic programs at the University's Scarborough campus.

Candidates should have a Ph.D. in mathematics or a related field and demonstrate an ability to pursue innovative research at the highest level, and a commitment to undergraduate and graduate teaching. The University of Toronto is an international leader in mathematics research and education, and the Department of Computer and Mathematical Sciences enjoys strong ties to other units within the University.

Applications should be received by January 17, 2010 to receive full consideration. (Code: UTSC)

Application Material Required:

Submit the following items online at this web site:

* Cover Letter
* Curriculum Vitae
* Research Statement
* Teaching Statement
* Publication List
* 4 Reference Letters (to be submitted by the reference writers)

And anything else requested in the job description.

Further Info:

http://www.math.utoronto.ca/
(416) 978-3317

The University of Toronto
Department of Mathematics
Bahen Centre
40 St George St Room 6290
Toronto, Ontario. Canada. M5S 2E4

2010 CMS MEMBERSHIP RENEWALS
RENOUVELLEMENTS 2010 À LA SMC

REMINDER:

Your membership reminder notices have been mailed. Please renew your membership as soon as possible. You may also renew on-line by visiting our website at www.cms.math.ca/members/

RAPPEL :

Les avis de renouvellements ont été postés. Veuillez s-il-vous-plaît renouveler votre adhésion le plus tôt possible. Vous pouvez aussi renouveler au site Web www.smc.math.ca/members.f/

CALL FOR NOMINATIONS
2010 Doctoral Prize

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

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

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

Nominations
Candidates must be nominated by their university and the nominator is responsible for preparing the documentation described below, and submitting the nomination to the address below. No university may nominate more than one candidate and the deadline for the receipt of nominations is **January 31, 2010**.

The documentation shall consist of:

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

APPEL DE MISES EN CANDIDATURE
Prix de doctorat 2010

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

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

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

Candidatures
Les candidats doivent être nommés par leur université; la personne qui propose un candidat doit se charger de regrouper les documents décrits aux paragraphes suivants et de faire parvenir la candidature à l'adresse ci-dessous. Aucune université ne peut nommer plus d'un candidat. Les candidatures doivent parvenir à la SMC au plus tard le **31 janvier 2010**.

Le dossier sera constitué des documents suivants :

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

Président du Comité de sélection du Prix de doctorat
Chair, Doctoral Prize Selection Committee
Société mathématique du Canada / Canadian Mathematical Society
105-1785 Alta Vista Drive
Ottawa, Ontario, Canada K1G 3Y6

CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

DECEMBER 2009 DÉCEMBRE

5 - 7 **2009 CMS Winter Meeting, Host: University of Windsor Hilton Hotel, Windsor (ON)**
www.cms.math.ca/Events/winter09/

14-17 The Joint Conference of ASCM 2009 and MACIS 2009
(JAL Resort Sea Hawk Hotel, Fukuoka, Japan)
http://gcoe.math.kyushu-u.ac.jp/ascm-macis2009/ascm-macis2009@math.kyushu-u.ac.jp

16-20 First Joint International Meeting of the AMS and the Korean Mathematical Society
Seoul, Korea
www.kms.or.kr/kmsams/

17-21 14th Asian Technology Conference in Mathematics
(Beijing, China)
www.mathandtech.org

JANUARY 2010 JANVIER

11-16 Topology, Geometry, and Dynamics: Rokhlin Memorial
(St Petersburg, Russia)
www.pdmi.ras.ru/EIMI/2010/tgd/

25-29 Metamaterials: applications, analysis and modeling
(UCLA, Los Angeles,CA)
www.ipam.ucla.edu/programs/meta2010/

22-24 Combinatorial Algebra meets Algebraic Combinatorics
(Fields Institute event at Queen's University)
www.mathstat.dal.ca/~faridi/research/inverse_systems/algebracombinatorics2010.html

FEBRUARY 2010 FÉVRIER

18 - 19 February Fourier Talks 2010
(Univ. of Maryland, College Park, MD)
www.norbertwiener.umd.edu/FFT/FFT10/index.html

22-26 Statistical and Learning Theoretic Challenges in Data Privacy
(UCLA, Los Angeles,CA)
www.ipam.ucla.edu/programs/data2010/

26-28 Workshop on Lie Theory and its Applications
(Fields Institute event at Carleton University)
www.fields.utoronto.ca/programs/scientific/09-10/lietheory

MARCH 2010 MARS

8-12 Workshop on Graphs and Arithmetic (CRM, Montreal, QC)
www.crm.umontreal.ca

8-12 AIM Workshop: Mock Modular Forms in Combinatorics and Arithmetic Geometry (AIM, Palo Alto, CA)
www.aimath.org/ARCC/workshops/mockmodular.html

27-29 Boise Extravaganza in Set Theory (Boise, Idaho)
http://diamond.boisestate.edu/~best/

APRIL 2010 AVRIL

16 The Nathan and Beatrice Keyfitz Lectures in Mathematics and the Social Sciences, Robert C. Merton, Harvard Business School
(Fields Institute event at the University of Toronto)
www.fields.utoronto.ca/programs/scientific/keyfitz_lectures/merton.html

MAY 2010 MAI

5-8 23rd International Workshop on Description Logics (DL2010)
(Fields Institute event at the University of Waterloo)

31-Jun 4 Harmonic Analysis Retrospective Meeting
(Fields Institute)

JUNE 2010 JUIN

Summer Workshop in Combinatorics
(Montreal)

2-5 Eighth Joint International Meeting of the AMS and the Sociedad Matemática Mexicana
Berkeley, California
www.ams.org/amsmtgs/2172_program.html

4-6 **2010 CMS Summer Meeting**
University of New Brunswick, Fredericton, NB
www.cms.math.ca/Events/summer10/

10-12 Geometric and Probabilistic aspects of General Relativity
(University of Strasbourg, France)
franchi@math.u-strasbg.fr

13-18 48th International Symposium on Functional Equations
(Batz-sur-Mer, France)
nicole.belluot@ec-nantes.fr

14-17 Fourth Annual International Conference on Mathematics & Statistics
(Athens, Greece)
www.atiner.gr/docs/Mathematics.htm

17-19 14th International Congress on Insurance: Mathematics and Economics
(Fields Institute at the University of Toronto)

20-25 Analysis, Topology and Applications 2010 (Vrnjacka Banja, Serbia)
http://www.tfc.kg.ac.rs/ata2010

28-July2 The Józef Marcinkiewicz Centenary Conference
(Poznanoznan, Poland)
www.jm100.amu.edu.pl

JULY 2010 JUILLET

5-9 Iwasawa 2010 Conference
(Fields Institute)
www.fields.utoronto.ca/programs/scientific/10-11/iwasawa

7-10 Eleventh International Conference on p-adic Functional Analysis
(Université Blaise Pascal, Les Cezeaux, Aubière, France)
Alain.escassut@math.univ-bpclermont.fr

26-Aug16 Topics in Noncommutative Geometry
(Universidad Buenos Aires, Argentina)
http://cms.dm.uba.ar/Members/gcorti/workgroup.GNC/3EIL

allow, or prevent, success in our teaching, in our research, and in our service to the broader human community. The various funding agencies set agendas and funding initiatives that may, or may not, support our goals and priorities as a community of professionals. Federal and provincial governments, in identifying priorities for the country, also directly affect what we can achieve through our professional efforts.

It is important to engage in a dialogue with administrators, with funding agencies, and with other bodies that set the environment for our work, to ensure that we have resources necessary to accomplish what is demanded of us in the creation, application, and dissemination of knowledge in the mathematical sciences. In this sense, we hold them accountable for setting the stage in which we do our work, just as we are held accountable for our own work.

In the last 10 or 15 years, there has been a recognition in the mathematical community that we can, as a group, explicitly identify what we need to accomplish our work, and we can collaborate with governments, administrators, businesses, and funding agencies to further our common goals. So, for instance, the mathematical community was able to identify the need to build up national institutes such as CRM, Fields, PIMS, AARMS, establish international centers such as BIRS, institute industry and health based initiatives such as MITACS and NPCDS, to achieve our aspirations as researchers and educators. By working with our government and funding partners, we were able to make the case that discoveries in "big science" is not exclusively facilitated by "big hardware" like particle accelerators, massive telescopes, and huge labs, but also by "big initiatives" such as our institutes and networks for the mathematical sciences.

This is an ongoing task. As changes come to universities, to NSERC and other funding agencies, with new priorities being set by governments, Boards of Governors, and the scientific directorship of the country, ask yourself — how does this affect our community of mathematical scientists? It is vital to engage yourself in a dialogue with your colleagues, to seek effective ways to respond to these changes, and to engage in a dialogue with governments, administrators, and funding agencies, to ensure that these new priorities also include the objectives of our community.

This weekend the leaders of the institutes, networks, and professional societies of the mathematical sciences community met in Banff to discuss the challenges and opportunities arising in this ever-changing environment of priorities and plans as set by governments, funding agencies, universities, and our own community. We look forward to your contribution of ideas, concerns, and action plans for the global community of mathematical scientists.

Tarifs et horaire 2010 Rates and deadlines

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

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

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

For more than 4 pages, or for the printing and inserting of camera ready material, please send a sample to the CMS Notes for a quote.
Surcharges apply for prime locations - contact notes-ads@cms.math.ca. Subscription to the Notes is included with the CMS membership. For non-CMS members, the subscription rate is $80 (CDN) for subscribers with Canadian addresses and $80 (US) for subscribers with non-Canadian addresses.

Pour plus de 4 pages, ou pour l'impression et l'inclusion d'une copie prête à la reproduction, veuillez envoyer un exemple aux Notes de la SMC afin d'obtenir un estimé.
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 80 $ CDN si l'adresse de l'abonné est au Canada et de 80 $ US si l'adresse est à l'étranger.

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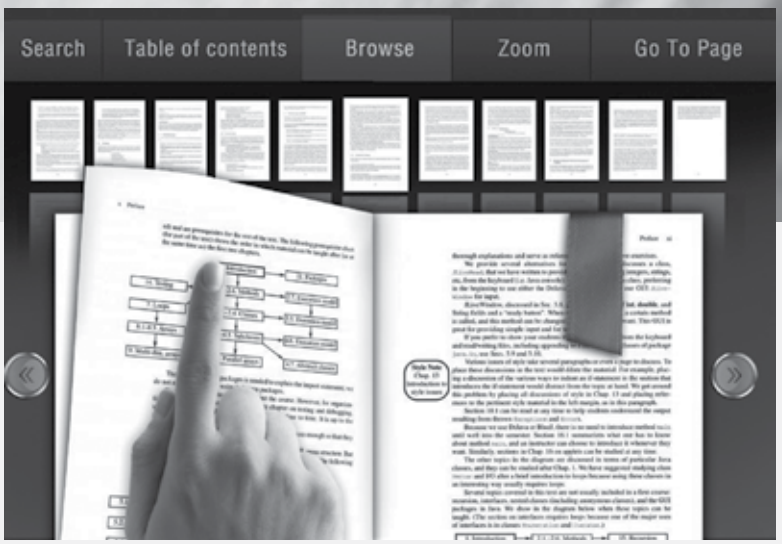

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