

CMS

NOTES

de la SMC

Volume 34

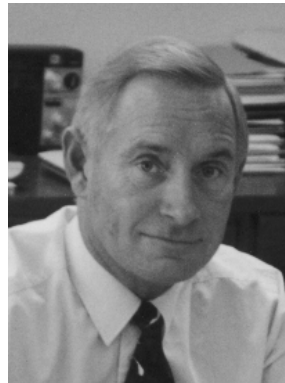
No. 3

April/ avril 2002

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### FROM THE EXECUTIVE DIRECTOR'S DESK



*Graham Wright*  
**At a Crossroads**

The Task Force Review Program that was begun in 1998 culminated with the Final Report of Task Force Number 9 - Executive and Governance - submitted to the Board of Directors in June 2001. Although, on many different fronts, much has been accomplished during the past three years, and many changes instituted, one important aspect currently being reviewed by the Executive Committee and the Board of Directors is a Publishing Plan for 2003 and beyond.

The 2001 Annual Committee Reports once again demonstrate the extensive range of research, publications and educational activities which are supported by the Society as well as the many members and other volunteers.

All of the Society's activities are coordinated through the Executive Office in Ottawa. The full-time staff includes the Operations Manager - Monique Bouchard, the Membership and Publications Agent - Liliane Sousa, the Administrative Clerk - Suzanne Lalonde, the Assistant to the Executive Director - Caroline Baskerville, and, effective July 1, 2001, Alan Kelm became the full-time Web Services Manager. The Society has experienced some difficulty in finding a suitable candidate for the remaining full-time position (the CMS Accountant) but I am confident the position will be filled in early 2002. Many members will have met the staff above at a CMS semi-annual meeting and, on behalf of the Society I wish to express our gratitude to all the staff, both full-time and part-time, for their valuable help and assistance.

Electronic services provide an ever increasing and important tool for our members, subscribers and others. Although the Society has devoted considerable resources to providing good electronic services, the level of work required has increased markedly and it was evident the Society needed a full-time Web Services Manager. I was delighted that Alan Kelm, the once part-time Camel East Site Manager, agreed to become the full-time Web Services Manager. The first major re-vamp of the CMS web site took place during 2001

*(see EXEC—page 32)*

*CMS NOTES*  
*NOTES DE LA SMC*

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2002

## EDITORIAL



*S. Swaminathan*

By the time this issue reaches you, you may have already known about the upcoming meetings and other important CMS events from the Web. Time was when one had to wait for a printed announcement of meeting dates, speakers, titles, etc. The marvel of the internet brings us anything (about information, that is), anytime and anywhere. It is a great leap from the days of nothing, never and nowhere.

Further, issues of the NOTES are also available on the internet. But getting a hard copy by snail mail has not yet become obsolete. There are many of us who prefer a printed copy. It has its own advantages - ready reference, can be read while reclining in an arm chair or even in bed, while travelling, etc. It is, of course, possible to print any required portion of any issue of the NOTES from the website or to download it into a laptop or palmtop.

In whatever form you read this issue, you will find yourself well informed about CMS activities, Fermat, reviews of recent books, challenging problems (by solving which you can win a prize), etc.

The electronic version of this issue can be accessed from <http://www.cms.math.ca/Publications/Notes>

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Au moment où vous recevrez ce numéro, vous aurez probablement eu vent, par le Web, des Réunions à venir et autres activités importantes de la SMC. Il fut pourtant un temps où il fallait attendre l'annonce écrite pour connaître l'arrivée d'une réunion, les conférenciers ou les titres des conférences... Grâce à Internet, nous avons tout ce que nous voulons (je parle d'information, entendons-nous), n'importe quand et n'importe où. Tout un pas de géant depuis l'époque où nous n'avions accès à rien, peu importe le moment ou le lieu.

Mêmes les NOTES sont désormais publiées sur le Web. Le bulletin papier envoyé par la poste ordinaire n'est toutefois pas entièrement tombé en désuétude. Bon nombre d'entre nous préfèrent lire la version papier, qui offre certains avantages : il est facile à consulter, il se lit confortablement assis dans un bon fauteuil ou même au lit, dans le train ou l'avion, etc. Bien sûr, il est aussi possible d'imprimer les sections des NOTES qui nous intéressent à partir du site Web, ou encore de télécharger le bulletin sur un portatif ou un ordinateur de poche.

Quel que soit votre format de prédilection, vous lirez dans ce numéro une foule de renseignements utiles à propos des activités de la SMC, un article sur Fermat, des critiques d'ouvrages parus récemment, des problèmes à résoudre (vous pourriez même gagner un prix), etc.

Pour obtenir une version électronique du présent numéro des NOTES, rendez-vous au <http://www.cms.math.ca/Publications/fNotes>.

## Pierre de Fermat (1601?–1665)–His life beside mathematics

by Klaus Barner, Universität Kassel

*This article is reprinted from the Newsletter of the European Mathematical Society, Issue 42, December 2001.*

The 400th birthday of Pierre de Fermat, the great seventeenth-century French mathematician, was celebrated in 2001. However, this is probably based on a fallacy (see [2]): Fermat was probably born in 1607, or in the first days of January 1608, in Beaumont-de-Lomagne. He was the son of the rich wholesaler and manufacturer Dominique Fermat, and his mother, Claire De Long, his father's second wife, came from a noble family of jurists (see [11]). Thus, strictly speaking, the celebrations and conferences with respect to Fermat's 400th birthday are premature. But we won't spoil the fun – we'll join the celebrations of Fermat's birthday, and report on his little-known private and professional life.



In the second half of the fifteenth century, the Fermat family apparently emigrated from Catalonia to Beaumont-de-Lomagne, a fortified village with a market, about 55 kilometers to the north-west of Toulouse. There, in the sixteenth century, Pierre Fermat's grandfather Anthoine ran an ironmongery that earned him a modest fortune which he bequeathed to his two sons Dominique (from his first marriage, Fermat's father) and Pierre (from his third marriage, Fermat's godfather). Both sons increased their father's inheritance to the best of their abilities. Dominique was particularly successful. A merchant who ran a leather wholesale trade with Italy, Spain and England, he also had a flourishing lime factory and gained considerable prosperity. He invested his profits in numerous

farms and other plots of land, which he leased on the basis of metayage (sharecropping) contracts.

Through his marriage with a noblewoman, Claire de Long, reflecting his increased standing, he gained access for his sons Pierre and Clément to the noblesse de robe. His family's social promotion was planned well in advance: for, the only way to achieve it was to buy the office of a parliamentary councillor (conseiller) at one of the Supreme Courts of Justice (cours de parlement) in the French provinces, such as Toulouse or Bordeaux. This custom, already disputed during the Ancien Régime but completely legal, had been introduced by the French Crown in the sixteenth century because of lack of money. The prerequisite for this was not only a respectable fortune. One had also to gain appropriate qualifications: three years of study of law, leading to a baccalaureus (juris civilis), and four years of practical experience as a lawyer at one of the Supreme Courts. Further, a suitable office had to be up for sale, and the support of members of the particular parliament was needed, requiring substantial favouritism. At the end there would be an entrance examination in law which not everyone passed.

Pierre de Fermat spent his schooldays with the Frères Mineurs Cordeliers in his home town. These were Franciscans who had settled in Beaumont around 1515 and founded a demanding grammar school in which classical Greek was taught, in addition to Latin, Italian and Catalan. This was unusual for the time in a small place with only 4000 inhabitants. For Pierre, who left school in 1623 at the age of 16, his good command of classical languages was a crucial precondition for his study in Orléans.

His choice of this place for study was well founded. The town on the Loire had an old and famous faculty of civil law whose reputation far beyond France attracted students from all parts of Europe – above all from Scotland, the Netherlands and Switzerland, as well as from German countries where students of Lutheran denomination formed a high proportion. In the sixteenth century Orléans had made a name for itself as a stronghold of humanistic jurisprudence. In this, a critical philological return to the classical origins and sources of Roman law (particularly Justinian) played a central part. A reliable mastery of Latin and classical Greek was indispensable for these studies, and the classical languages were especially cultivated by the faculty of the artes liberales of Orléans. A baccalaureate from Orléans undoubtedly gained a young jurist a considerable reputation.

Around August 1626, Pierre de Fermat passed his examinations in Orléans, and duly received his certificate for successfully passing the examination of baccalaureus juris civilis. In the following month Dominique Fermat wrote his last will and testament. Giving a compensation to his younger

son Clément, and fixing the dowries of his daughters Louise and Marie, he chose his elder son Pierre as sole heir.

Pierre Fermat proceeded to Bordeaux and was sworn in as a lawyer by the Grand' Chambre of the parlement de Bordeaux in November 1626. Being called to the Bar of one of the French provincial parliaments, he had to set up in practice as a lawyer, because this was by royal law a precondition for recognition as a conseiller by the Minister of Justice. After his natural choice of Orléans as a place of study, his selection of Bordeaux for practising as a lawyer was surprising; for many different reasons Toulouse was a more obvious choice. It is likely that Fermat's choice of Bordeaux is connected with his mathematical leanings.

In Bordeaux, there was a small circle of lovers of mathematics, of whom the names D'Espagnet, Philon and Prades are known from Fermat's correspondence; Étienne D'Espagnet, whose father had been first president of the parliament of Bordeaux and a friend of Viète, owned Viète's works which were very difficult to obtain at that time. Here Fermat, who was just 20, started his mathematical career. But who advised him to settle as a lawyer in Bordeaux? It was probably Jean Beau-grand, who cultivated scientific relations with the gentlemen in Bordeaux. Fermat may have made his acquaintance in August 1626 in Orléans. At any rate, it is significant that Beau-grand followed Fermat's mathematical career with particular interest, and he always proudly reported on Fermat's achievements during his journeys to Italy and elsewhere. Beau-grand obviously felt that he had 'discovered' Fermat.

When Dominique Fermat died on 20 June 1628, Pierre became a wealthy man, and had only another two years to spend as an avocat in Bordeaux. If the opportunity then arose for him to buy a conseiller's office (in Toulouse, preferably), the first stage of the family plan would be achieved. This opportunity arose at the end of 1630, during a severe plague epidemic that carried off numerous conseillers au parlement in Toulouse. On 29 December 1630, Fermat concluded an advance contract with Ysabeau de la Roche, widow of Pierre de Carrière, conseiller au parlement de Toulouse and commissaire aux requêtes, regarding the purchase of the deceased's office.

The purchase price of 43500 livres, with an initial payment of 3000 livres on taking up the office, represented a usual, but enormous, sum. A farmer could earn about 100 livres per year, a parish priest some 300 livres, and a busy conseiller up to 1500 livres on which he then had to pay tax. From an economic point of view such a purchase was a miserable deal, particularly since by royal law the conseillers were not allowed to carry on a trade or practise a craft; nearly all of them earned their living from their estates, which they leased. Fermat, who had inherited from his father six farms and numerous other pastures, gardens and vineyards, was no exception in this respect. Only very wealthy landowners could afford the luxury of purchasing an office of this kind. The 'profit'

consisted of advancement into the noblesse de robe, the social reputation and privileges that went with it, and participation in political power.

After Fermat had asked for the king's consent and passed the prescribed entrance examination of the parlement de Toulouse, he was sworn into office by the Grand' Chambre on 14 May 1631. From this moment onward, he enjoyed all the rights and privileges of a conseiller's office – the income from his office, and the right to use the title *écuyer* and put 'de' before his name.

The close chronological linking between Fermat's appointment as conseiller au parlement and his marriage with Louyse de Long, the daughter of Clément de Long, conseiller au parlement de Toulouse, is interesting. The marriage contract was concluded on 18 February 1631, and on 30 March, de Long paid his future son-in-law 2865 livres as a down payment on the promised dowry of 12000 livres. The church wedding took place on 1 June in the Cathédrale St-Etienne of Toulouse.

The de Longs, remote relatives of Fermat's mother, lived in Toulouse in the rue Saint-Remesy, and also possessed a house in Beaumont-de-Lomagne adjoining the premises of the Fermat family. In that house Clément de Long used to spend his parliamentary vacations. Pierre and Louyse must have known each other from childhood, and their marriage seems to have been settled by the families long ago, provided that Pierre made it to conseiller au parlement. Contemporaries praise the beauty, beguiling charm and charity of the young woman who bore Pierre five children, Clément-Samuel, Jean, Claire, Catherine and Louise.

The French provincial parliaments of the Ancien Régime were not parliaments by today's standards. The idea of separating the powers of legislature, executive and judiciary, which had been elaborated by John Locke and Charles de Montesquieu and politically realised much later, was still completely unknown in the seventeenth century. The parlements performed the tasks of lawmaking, administration and jurisdiction, so far as they had been transmitted to them by the Crown for the provinces administered by them.

The parliament de Toulouse was opened for the first time in 1303. From the start, its area of responsibility included the complete south-east of the kingdom. Following the Parisian model, it had a Grand' Chambre, the original chamber from which all other chambers developed for procedural reasons: the chambre criminelle (also known as la Tournelle) and two chambres des enquêtes. The Tournelle dealt in the final instance with all offenders threatened with corporal punishment, and no clergyman was allowed to be a member of it; this chamber regularly delighted the citizens of Toulouse with its public executions. Each year two conseillers were exchanged between the Grand' Chambre and Tournelle, so that they were

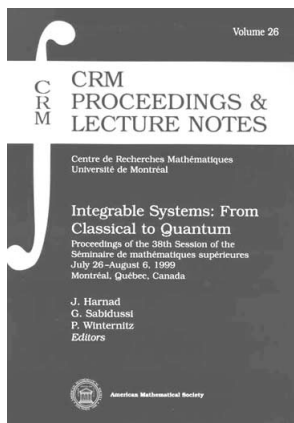
(see *FERMAT*–page 26)

# Integrable Systems: From Classical to Quantum

Book Review by Lisa Jeffrey, University of Toronto

## Integrable Systems: From Classical to Quantum

edited by J. Harnad, G. Sabidussi and P. Winternitz  
 CRM Proceedings 26  
 AMS, 2000  
 264 pp



The origin of the term “integrable system” lies in physics. The objects of interest are manifolds equipped with a symplectic structure: the prototype is the phase space of classical mechanics, which parametrizes the coordinates and momenta of a physical system. Any smooth function on the phase space gives rise to a flow (the Hamiltonian flow): if the symplectic form is written

$$\omega = \sum_i dq_i \wedge dp_i$$

in local coordinates  $p_i, q_i$ , then we write the Hamiltonian vector field  $X_H$  of the function  $H$  as

$$X_H = \sum_i \left( -\frac{\partial H}{\partial q_i} \frac{\partial}{\partial p_i} + \frac{\partial H}{\partial p_i} \frac{\partial}{\partial q_i} \right).$$

In other words  $X_H$  is that vector field whose contraction with the symplectic form is the 1-form  $dH$ :

$$\iota_{X_H} \omega = dH$$

The Poisson bracket of two functions  $f$  and  $g$  is defined as

$$\{f, g\} = \omega(X_f, X_g)$$

so the Poisson bracket of  $f$  and  $g$  is 0 if  $f$  is constant along the flow lines generated by  $g$ .

A symplectic manifold of dimension  $2n$  is called an *integrable system* if it has  $n$  functions  $f_1, \dots, f_n$  whose Poisson brackets are 0 and whose Hamiltonian vector fields are linearly independent almost everywhere. One familiar class of integrable systems is the toric varieties; these are symplectic manifolds of dimension  $2n$  equipped with  $n$  Poisson commuting functions  $f_1, \dots, f_n$ , for which almost all orbits of the Hamiltonian flows are periodic with period 1. Equivalently these manifolds are equipped with an effective action of the group  $(U(1))^n$  and the action of the  $i$ -th copy of  $U(1)$  is generated by the Hamiltonian flow of the function  $f_i$ . Basic examples include complex projective spaces. These examples are not typical though, since periodic orbits of Hamiltonian flows are ordinarily difficult to find and the situation where all orbits are periodic is not usual.<sup>1</sup>

This monograph presents lectures given as part of a two-week summer school (the Séminaire de Mathématiques Supérieures at the Department of Mathematics and Statistics of the Université de Montréal) for graduate students, postdoctoral fellows and researchers. The Université de Montréal has hosted many such summer schools over the years, a highly successful series. The organizers of the 1999 summer school were J. Harnad, G. Sabidussi and P. Winternitz. The monograph presents several essentially complete lecture series (a total of 12 series of 3-5 lectures each took place

during the series, and 9 of these are presented in this volume). There were additional lectures on more advanced research topics, and three of these are presented. The topics covered in the lectures ranged from examples occurring in algebraic geometry to applications in physics (for example, statistical mechanics).

There is not enough space to describe the contents of many of the lectures in detail. I shall therefore limit my comments to four of the lecturers: J. Harnad, J. Hurtubise and N. Reshetikhin (who treated classical aspects) and J.-M. Maillet (who treated quantum aspects).

J. Harnad presents a comprehensive treatment of integrable systems arising from loop groups. The flows in these systems can be written in Lax form:

$$\frac{dL}{dt} = [A, L]$$

which implies that the eigenvalues of  $L$  remain constant over time. Examples include loop algebras and certain examples of solutions to the nonlinear Schrödinger equation and the Toda flow. The classical modified Yang-Baxter equations, and the associated linear and quadratic R-matrix structures are reviewed, with emphasis on the “split” case, which for linear structures coincides with the Adler-Kostant-Symes theorem.

The lecture series by J. Hurtubise treats integrable systems arising from the Hitchin system. The Hitchin system involves pairs  $(E, \phi)$  where  $E$  is a holomorphic vector bundle over a Riemann surface  $\Sigma$  (with fibre a Lie algebra  $\mathfrak{g}$ ) and  $\phi$  is a 1-form valued section of the adjoint bundle of  $E$  with poles

<sup>1</sup>According to the Liouville-Arnol’d theorem, any compact connected component of a level set  $\cap_i f_i^{-1}(e_i)$  of an integrable system is a torus; so  $U(1)^n$  appears in the more general situation as well.

along a divisor in  $\Sigma$ . It is in fact a compactification of the cotangent bundle of the moduli space of holomorphic vector bundles on  $\Sigma$ .

If  $p$  is a polynomial function on  $\mathfrak{g}$  then  $p(\phi)$  is a differential form on  $\Sigma$  and the collection of all such differential forms gives the structure of integrable system to the Hitchin system. These systems form a universal example in the sense that many familiar examples (for example phase spaces associated to spinning tops and geodesics on the ellipsoid) can be recovered as special cases.

The lectures of N. Reshetikhin present a treatment of integrable systems associated to Poisson-Lie groups. In the course of these lectures the basic ideas from Poisson geometry and the theory of Poisson-Lie groups are presented; for example the idea of the double of a Poisson-Lie group is developed, and a number of examples are treated.

The lecture of J.-M. Maillet treats quantum integrable systems: a particular example presented is the  $XXZ$  spin- $\frac{1}{2}$  Heisenberg finite chain. The author computes correlation functions of

lattice quantum integrable models using the algebraic Bethe ansatz method, and describes the explicit resolution of the quantum inverse scattering problem.

This monograph is a welcome addition to the bookshelf of anyone interested in geometry and in physical applications. It presents some material at a quite introductory level and treats other topics from an advanced point of view, so it should appeal to researchers at all levels.

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## CALL FOR NOMINATIONS / APPEL DE CANDIDATURES

### Coxeter-James / Jeffery-Williams / Krieger-Nelson Prize Lectureships

### Prix de conférence Coxeter-James / Jeffery-Williams / Krieger-Nelson

The CMS Research Committee is inviting nominations for three prize lectureships.

The Coxeter-James Prize Lectureship recognizes outstanding young research mathematicians in Canada. The selected candidate will deliver the prize lecture at the Winter 2003 Meeting in Burnaby, British Columbia. Nomination letters should include at least three names of suggested referees.

The Jeffery-Williams Prize Lectureship recognizes outstanding leaders in mathematics in a Canadian context. The prize lecture will be delivered at the Summer 2004 Meeting in Halifax, Nova Scotia. Nomination letters should include three names of suggested referees.

The Krieger-Nelson Prize Lectureship recognizes outstanding female mathematicians. The prize lecture will be delivered at the Summer 2004 Meeting in Halifax, Nova Scotia. Nomination letters should include three names of suggested referees.

The deadline for nominations is **September 1, 2002**. Letters of nomination should be sent to the address below.

Le Comité de recherche de la SMC invite les mises en candidatures pour les trois prix de conférence de la Société, la

Conférence Coxeter-James, la Conférence Jeffery-Williams et la Conférence Krieger-Nelson.

Le prix Coxeter-James rend hommage à l'apport exceptionnel des jeunes mathématiciens au Canada. Le candidat choisi présentera sa conférence lors de la réunion d'hiver 2003 à Burnaby (Columbie Britannique). Les lettres de mises en candidatures devraient inclure les noms d'au moins trois répondants possibles.

Le prix Jeffery-Williams rend hommage à l'apport exceptionnel des mathématiciens d'expérience au Canada. La Conférence sera présentée lors de la réunion d'été 2004 à Halifax (Nouvelle Écosse). Les lettres de mises en candidature devraient inclure les noms d'au moins trois répondants possibles.

Le prix Krieger-Nelson rend hommage à l'apport exceptionnel des mathématiciennes au Canada. La Conférence sera présentée lors de la réunion d'été 2004 à Halifax (Nouvelle Écosse). Les lettres de mises en candidatures devraient inclure les noms d'au moins trois répondants possibles.

La date limite pour les mises en candidatures est le **1er septembre 2002**. Les lettres de mises en candidatures devraient être envoyées à :

**Douglas Stinson, CMS Research Committee / Comité de recherche de la SMC**  
**Department of Pure Mathematics**  
**University of Waterloo**  
**200 University Ave West**  
**Waterloo, ON Canada**  
**N2L 3G1**

## EDUCATION NOTES

Ed Barbeau and Harry White, Column Editors

### Helping students gain experience

by Margaret Sinclair

Faculty of Education, York University

During the education session of the Winter meeting of the Canadian Mathematical Society in Toronto in December, 2001, part of the discussion focussed on how to help students develop problem solving and proof skills. Participants expressed concern that many students approach problems and proofs with a bad attitude, spend a great deal of time but write very little, perform computations not relevant to the given information or the required answer, do not draw diagrams and do not introduce variables.

Professors expect students to read a problem, analyze the information (using a diagram if appropriate), decide on a course of action, and follow through — but they are experts. Before examining ideas for helping students, let us consider what it means to be an expert.

In the 1960s, DeGroot conducted research on the expertise of chess masters. He concluded:

We know that increasing experience and knowledge in a specific field (such as chess) has the effect that things (properties, *etc.*), which, at earlier stages, had to be abstracted, or even inferred are apt to be immediately perceived at later stages. To a rather large extent, abstraction is replaced by perception . . . As an effect of this replacement, a so-called ‘given’ problem situation is not really given since it is seen differently by an expert than it is perceived by an inexperienced person. *DeGroot, Thought and Choice in Chess, 1965:33-34*

We now know that experts across disciplines share many of the following traits (*cf. Glaser, 1992*).

Experts are good at retrieving knowledge relevant to a particular task. They have a superior recall because their knowledge is “conditionalised” (*i.e.*, includes specifications of the contexts in which it is useful). Knowledge that is not conditionalised often cannot be activated even if it is relevant. Textbooks can hamper development of conditionalised knowledge; the separation of topics by chapter permits students to use location clues to decide which concepts and formulae are relevant.

Experts recognize patterns of information. They “see” more than novices do. Specifically, experts in the field of mathematics perceive connections in and between a variety of representations – graphical, diagrammatic and algebraic. Many students restrict themselves to algebraic representations, perhaps because diagrams and graphs contain a great

deal of information in a non-linear format, which makes them more difficult to interpret. In addition, however, most students have not been explicitly taught to reason with diagrams.

Experts’ knowledge is not simply a list of facts and formulas relevant to their domain. It is organised around core concepts or “big ideas”. This structure allows experts to focus on underlying principles and procedures when approaching a problem. Unfortunately, many curricula do not provide sufficient opportunities for students to consolidate their knowledge around the big ideas.

Experts demonstrate adaptive expertise; that is, they are able to approach new situations flexibly by “transferring knowledge”. They are also metacognitive; they continually question their current performance and adjust their strategies accordingly.

To help students gain experience we can choose educational strategies that have been shown to foster student learning in mathematics. The following suggestions address first year concerns but can be adapted to improve learning at any level.

**Provide scaffolding.** Incoming students’ knowledge may be fragile because it has been applied infrequently. In addition, students from high school have often learned only one application of a concept, may have used different terminology or symbolism, and have probably had very little experience analysing diagrams. Scaffolding techniques, such as providing short reviews of critical content and terminology, giving partial explanatory proofs for students to complete or revise, and providing explicit assistance in interpretation of diagrams, can help students overcome difficulties and gain confidence.

**Strengthen conceptual understanding.** Although links between mathematical ideas may seem obvious to experts, students may not perceive the underlying structure – a problem that leads to difficulties with abstraction and generalisation. Conceptual understanding can be strengthened by drawing attention to important, organising ideas; using multiple representations to help students make connections between graphical, diagrammatic, and algebraic arguments; helping students categorise and analyse problems according to underlying principles; and encouraging students to investigate an idea before trying to prove it.

**Help students “notice”.** Experts focus on meaningful patterns of information. To use this strategy, students must first learn to interpret what they see – to “notice”. Educators can help by directing student attention towards important

diagrammatic details, using contrasting cases to emphasise distinguishing features, and using visual logic representations (e.g., arrows from fact to deduction) to highlight patterns in argument structure.

**Introduce experts' methods.** Alan Schoenfeld, a noted mathematics education researcher, encourages his students to approach problems as experts would – by analysing, discussing, conjecturing, and collaborating (Schoenfeld, 1994). To help them develop these skills he provides increased time for problem solving and discussion, and encourages students to solve problems in groups. He also challenges his students to bring problems for him to solve, in order to model how a mathematician works on unfamiliar material.

Schoenfeld's methods can be adapted to address the development of proof skills. The key is to engage students in the initial stages that experts use – identifying an interesting relationship, and investigating its behaviour. This helps students understand that the elegant formal argument we call a proof is actually a final product.

**Promote reflective thinking.** Skemp (1987) writes, "The final contribution of the excellent teacher is . . . gradually to reduce the learner's dependence". We can help students develop the ability to monitor their own thinking by: discussing problem solving strategies rather than just solutions, by engaging them in problem solving that requires students to pose and solve their own questions, and by encouraging students to be metacognitive – to continually examine and question what they know.

In the end, it is important to remember that experts have spent hours perfecting their skills. Time on task is a major indicator for learning, and deliberate practice is an efficient way to promote expertise (Bransford et al, p. 161). This applies equally to students of mathematics, and to those who strive for excellence in teaching mathematics.

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Schoenfeld, A.H. (1994), Reflections on doing and teaching mathematics. In A.H. Schoenfeld (ed.), *Mathematical thinking and problem solving* (pp. 53-70). Hillsdale, NJ:

Lawrence Erlbaum Associates.

Skemp, R.R. (1987). *The psychology of learning mathematics*. Hillsdale, NJ: Lawrence Erlbaum Associates.

### More articles from IJMEST

In December, February and March, I presented summaries of some articles from Volume 31, Number 1 (January-February, 2000) of *International Journal of Mathematical Education in Science and Technology*. Here are the last four.

*Redesigning the calculus sequence at a research university: issues, implementation, and objectives*, Harvey B. Keynes & Andrea M. Olson, United States of America. In the academic year, 1995-1996, the Institute of Technology Centre for Educational Programs of the School of Mathematics at the University of Minnesota piloted the Calculus Initiative (CI), a reformed calculus sequence for science, engineering and mathematics students. Designed to improve student learning and critical thinking skills, the program provided opportunities for active learning, innovative pedagogical methods, increased student/faculty contact and more exposure to the conceptual and visual aspects of calculus. The instructional team included faculty, experienced secondary teachers, graduates and even undergraduates. This article reports on four years of operation and compares the performance of its students with a traditionally taught control group. The CI regime registered better achievement, improved retention, higher ratings for lectures and workshops and better interactions between lecturers and students. Increasingly, as they progressed, students valued their experience with technology, both graphing calculators and the computer packages *Maple*, *Mathematica* and *Matlab*. The authors claim that, by the third quarter, many students evinced the following ability profile: to carefully carry out computations, to think geometrically and conceptually, to explore concepts creatively, to work independently and with others, to communicate mathematical concepts clearly.

*A reform in undergraduate mathematics curriculum: more emphasis on social and pedagogical skills*, M.E. Pesonen & T. Malvela, Finland. Recent reforms in teacher education at the University of Joensuu were impelled by a decrease in the number of students presenting themselves for teaching mathematics and physics as well as the realization that there should be more varied modes of instruction and social interaction in the program. About a decade ago, a Development Project of Mathematics and Physics Teacher Education was founded to (1) improve the cooperation between the departments of mathematics and physics, the faculty of education and the practice school; (2) develop new courses with attention to pedagogical and interdisciplinary aspects; (3) introduce new learning environments; and (4) make corresponding changes in the syllabus. This paper describes the



changes: student tutorial study groups, professionally and pedagogically oriented courses, computer supported courses, problem-solving groups. Some problems of assessment and group work are discussed. The changes were generally well-received by the students and there is a greater interest in mathematics in primary school education.

*Policy issues in the teaching and learning of the mathematical sciences at university level*, Jan Thomas, Australia. Using Australia as a case study, the author argues that, increasingly, mathematics education is controlled by powerful bureaucracies, and that policy decisions and their implementation affect the teaching and learning of mathematics in many ways. She points to many factors of the antipodal situation that many of us in Canada will recognize: consultation with the overriding of professional opinion at the point of decision; the replacement of professional staff at the Ministry level by contract workers who often may not have a background in mathematics or education, the lowering of the “benchmarks” for the masses with a high quality education for the few, and an over-utilitarian approach to the curriculum. She calls for professional societies to become more politically active by effectively using the media to change public attitudes, lobbying

politically, networking, and raising awareness with students, parents and teachers.

*A metacognitive intervention in mathematics at university level*, Rosetta Zan, Italy. Recognizing that metacognitive and affective factors may prevent students from correctly utilizing knowledge that they may already possess, the author set up an instructional intervention with 27 biology students who repeatedly failed a compulsory mathematics course that included calculus, algebra and geometry. This separate course met four hours for each of six weeks to prepare students for both oral and written examinations. Students were expected to diligently complete the requirements, study selected topics on their own, write self-evaluation tests, and then, with the teacher as a support, work exercises and problems. A major goal was to help students plan their studying and make judgments about appropriate strategies. The resulting improvement in attitude and behaviour led to all students passing the examinations and over a third of them getting more than 80%. The author analyzes the results and provides some sample material.

*Ed Barbeau*

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**McMASTER UNIVERSITY – HAMILTON, ONTARIO  
DEPARTMENT OF MATHEMATICS & STATISTICS  
SHARCNET Chair in Scientific Computation**

The Department of Mathematics Statistics, McMaster University, invites applications for a SHARCNET Chair in Scientific Computation starting 1 July 2002. This Chair is funded by SHARCNET, which has developed a network of high-performance computer clusters spanning seven universities and colleges in Southern Ontario. The McMaster site has a 112-node cluster and a 16-node shared memory machine (please see [www.sharcnet.ca](http://www.sharcnet.ca) for more information).

Candidates should have a Ph.D., have the potential to become an international leader in numerical analysis and/or scientific computation, and have demonstrated interest and ability in teaching. The successful candidate will have a particular interest in parallel algorithms, as well as a strong scientific background in applied mathematics or mathematical physics.

The salary and rank will be based on qualifications and experience. Normally the appointment will be made at the tenure-track assistant or associate professor level, but tenure may be offered in exceptional circumstances.

All qualified candidates are encouraged to apply; however, Canadian citizens and permanent residents will be considered first for this position. McMaster University is strongly committed to employment equity within its community, and to recruiting a diverse faculty and staff. The University encourages applications from all qualified candidates, including women, members of visible minorities, Aboriginal persons, members of sexual minorities, and persons with disabilities.

Applications, including a curriculum vitae and a letter of application should be sent to: M. Valeriote Chair, at the following address. Applicants should also arrange for at least three letters of recommendation to be sent to the chair. These letters should address the applicant’s research accomplishments and supply evidence that the applicant can communicate articulately and teach effectively.

Review of applications will begin on **April 1, 2002**.

**Dr. M. Valeriote  
Chair  
Mathematics & Statistics  
McMaster University  
Hamilton, ON L8S 4K1  
CANADA**

## FROM THE INSTITUTES

### BIRS Schedule 2003

#### 5-day Workshops

03/15–03/20 Recent Developments in Superstring Theory  
 03/22–03/27 Scattering and Inverse Scattering  
 03/29–04/03 Commutative Algebra and Geometry  
 04/05–04/10 BIRS Workshop on Noncommutative Geometry  
 04/12–04/17 Quantum Mechanics on the Large Scale  
 04/19–04/24 Computational Fuel Cell Dynamics-II  
 04/26–05/01 The Many Aspects of Mahler's Measure  
 05/03–05/08 Recent Advances in Algebraic & Enumerative Combinatorics  
 05/10–05/15 Statistical Mechanics of Polymer Models  
 05/17–05/22 PIMS Graduate Modelling Camp  
 05/24–05/29 Constraint Programming, Belief Revision, & Combinatorial Optimization  
 05/31–06/05 Symmetry and Bifurcation in Biology  
 06/07–06/12 Applicable Harmonic Analysis  
 06/14–06/19 Integration on Arc Spaces, Elliptic Genus & Chiral de Rham Complex  
 06/21–06/26 Point Processes–Theory and Applications  
 06/28–07/03 Joint Dynamics  
 07/05–07/10 Mathematical Biology: From Molecules to Ecosystems  
 07/12–07/17 Perspectives in Differential Geometry  
 07/19–07/24 Differential Invariants & Invariant Differential Equations  
 07/26–07/31 Analysis and Geometric Measure Theory  
 08/02–08/07 Monge-Ampere Type Equations and Applications  
 08/09–08/16 Localization Behavior in Reaction-Diffusion Systems & Applications to the Natural Sciences  
 08/09–08/16 Defects and their Dynamics  
 08/16–08/21 Current Trends in Arithmetic Geometry and Number Theory  
 08/23–08/28 Computational Techniques for Moving Interfaces  
 08/30–09/04 A Creative Writing Workshop at BIRS  
 08/30–09/04 Locally Finite Lie Algebras  
 09/06–09/11 Regularization in Statistics  
 09/13–09/18 Topology in and around Dimension Three  
 09/20–09/25 Structural and Probabilistic Approaches to Graph Colouring  
 09/27–10/02 Stochastic Partial Differential Equations  
 10/04–10/09 Quadratic Forms, Algebraic Groups, and Galois Cohomology  
 10/11–10/16 BANFF Credit Risk Conference 2003  
 10/18–10/23 MITACS Special Industrial Forum  
 10/25–10/30 Current Trends in Representation Theory of Finite Groups  
 11/01–11/06 PIMS HOT TOPICS  
 11/08–11/13 Optimal Transportation and Nonlinear Dynam-

ics

11/15–11/20 The Interaction of finite Type and Gromov-Witten Invariants.  
 11/22–11/27 Theory and Numerics of Matrix Eigenvalue Problems  
 11/29–12/04 Nonlinear Dynamics of Thin Films and Fluid Interfaces  
 12/06–12/11 Calabi-Yau Varieties and Mirror Symmetry  
 12/13–12/18 p-adic Variation of Motives  
 12/13–12/18 Coordinate Methods in Nonselfadjoint Operator Algebras

#### Focused Research Groups

##### Research in Teams/Summer Schools

04/26–05/09 Topological Orbit Equivalence for Dynamical Systems  
 05/10–05/23 Regularity for Hypergraphs  
 05/24–06/06 Topology and Analysis  
 06/07–06/20 Quantum Algorithms and Complexity Theory  
 06/21–06/27 Differential Geometry  
 06/28–07/10 IMO Training Camp  
 07/19–08/01 Problems in Discrete Probability  
 08/02–08/15 Variance of Quasi-Coherent Torsion Cousin Complexes  
 08/02–08/22 Representation Theory of Linearly Compact Lie Superalgebras and the Standard Model  
 08/16–09/05 Local Uniformization and Resolution of Singularities  
 08/23–09/05 Invariant Manifolds for Stochastic Partial Differential Equations  
 09/06–09/19 Arithmetic of Fundamental Groups  
 10/02–10/04 West Coast Operator Algebra

#### Fields Distinguished Lectures

The Fields Institute solicits proposals for its Distinguished Lecture Series. Speakers selected for the Distinguished Lecture Series are asked to give three one-hour talks. One of these talks is designed for a general mathematical audience including graduate students and post-doctoral fellows. The other talks are of a more advanced nature and are often planned, in collaboration with the organizers of the current thematic program, with the participants of the program in mind. Proposals and nominations for these series are considered at the fall and spring meetings of the Scientific Advisory Panel (SAP), and should be sent by September 15 or March 15 to:

Dr. Kenneth R. Davidson, FRSC  
 Chair, Scientific Advisory Panel  
 The Field Institute for Research in Mathematical Sciences  
 222 College Street, Second Floor  
 Toronto, Ontario M5T 3J1

## AWARDS / PRIX

### CMS Prizes Announced

The Canadian Mathematical Society has selected Leah Keshet as the winner of the 2003 Krieger-Nelson Prize, Ram Murty the winner of the 2003 Jeffery-Williams Prize, and Lisa Jeffrey as the winner of the 2002 Coxeter-James Prize.

#### CMS 2003 Krieger-Nelson Prize

##### Leah Keshet (University of British Columbia)

The Krieger-Nelson Prize recognizes outstanding research by a female mathematician.

Dr. Leah Keshet obtained her B.Sc. from Dalhousie University in 1974, and her Ph.D. from the Weizmann Institute in 1982. Prior to joining the University of British Columbia in 1989, she was a faculty member at Duke University.

Leah Keshet attained the rank of full professor in 1995 and is Director of the MITACS project "Biomedical Models of Cellular and Physiological Systems in Health and Disease", which uses mathematical modelling and analysis for various biomedical problems. She was an invited plenary speaker at the 2000 International Congress of Applied Mathematics in Edinburgh.

Leah Keshet is in the front rank of theoretical biologists world-wide. She has an excellent ability to abstract the sense of a biological problem into a well-posed mathematical problem suitable for analysis and modelling. She has investigated new and challenging biological problems involving a diversity of mathematical techniques. She uses all types of methods, from rigorous analysis to simulations.

Her research has greatly influenced people in thinking about biological phenomena in a mathematical way. She has also written what is regarded as the best textbook on biological modelling. It has been called a remarkable demonstration of her deep understanding of a staggering range of problems in mathematical biology. Dr. Leah Keshet will present the 2003 Krieger-Nelson Prize Lecture at the University of Alberta in June 2003.

#### CMS 2003 Jeffery-Williams Prize

##### Ram Murty (Queen's University)

The Jeffery-Williams Prize recognizes mathematicians who have made outstanding contributions to mathematical research.

Dr. Ram Murty obtained his B.Sc. from Carleton University in 1976, and his Ph.D. from MIT in 1980. Prior to joining Queen's University in 1996, he was a faculty member at McGill University.

Ram Murty attained the rank of full professor in 1989 and was elected as a fellow of the Royal Society of Canada in 1990. He was the winner of the 1988 CMS Coxeter-James

Prize, was a Steacie Fellow in 1991, and received a Killam Research Fellowship in 1998.

Ram Murty has made systematic, significant and extensive contributions to the central and difficult area of number theory dealing with L-functions and to problems in closely related areas of arithmetic algebraic geometry. His work is in the domain of algebraic and analytic number theory, in which algebra and analysis are fused in the study of number theory. His contributions are of significant depth and beauty, and have been of interest to a broad range of mathematicians.

Ram Murty has made many important research contributions. In collaboration with his brother, Kumar Murty, and Ravi Gupta, their unconditional proofs related to Artin's 1920's conjecture on primitive roots, have been called "truly spectacular".

Dr. Ram Murty will give the 2003 Jeffery-Williams Prize Lecture at the University of Alberta in June 2003.

#### CMS 2002 Coxeter-James Prize

##### Lisa Jeffrey (University of Toronto)

The Coxeter-James Prize recognizes young mathematicians who have made outstanding contributions to mathematical research.

Dr. Lisa Jeffrey obtained her A.B. from Princeton University in 1986, and her Ph. D. from Oxford University in 1992. Prior to joining the University of Toronto in 1997, she was a faculty member at Princeton University and McGill University.

Lisa Jeffrey attained the rank of full professor in 1997. She has won numerous awards - the 1996 Aisenstadt Prize, a Sloan Fellowship in 1997, an Ontario Premier's Research Excellence Award in 1999, and the CMS 2001 Krieger-Nelson Prize.

Lisa Jeffrey's research involves significant and difficult problems at the forefront of several deep mathematical areas: symplectic geometry, algebraic geometry, mathematical physics and differential geometry. She has made major contributions to all of these fields.

Lisa Jeffrey has been involved in the proof of two of the most important conjectures in equivariant symplectic geometry. The proof of Witten's conjecture, which she obtained in collaboration with Frances Kirwin, introduced the powerful technique of non-abelian localization which has had important applications.

She is the author of "Quantum Fields and Strings: a Course for Mathematicians" - the definitive work for mathematicians on the important recent interaction between theoretical physics and geometry.

Dr. Lisa Jeffrey will present the 2002 Coxeter-James Prize Lecture at the University of Ottawa in December 2002.

## Outstanding New Mathematics Titles from Cambridge



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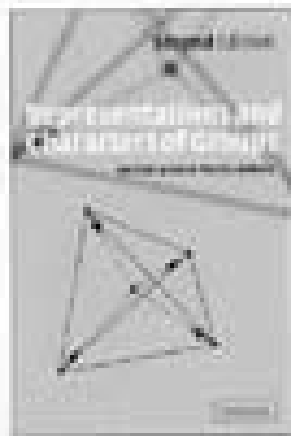
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**Andrew Pressley, Editor**

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### Aspects of Sobolev-Type Inequalities

**Laurent Saloff-Coste**

Covers the ultrahyperbolicity of the heat diffusion semigroup, Gaussian heat kernel bounds, the Borell-Isoperimetric-Lieb-Otal inequality and elliptic and parabolic Harnack inequalities.

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**CMS Summer Meeting 2002**  
**Université Laval**  
**Québec City, Québec**  
**June 15 - 17, 2002**

**Programme Update**

The most up-to-date information concerning the programmes, including scheduling, and electronic registration is available at the following world wide web address:

<http://www.cms.math.ca/Events/summer02>

Meeting registration forms and hotel accommodation forms can be found in the February 2002 issue of the *CMS Notes* and are also available on the website, along with on-line forms for registration and submission of abstracts.

**Updates on Symposia Speakers**

There have been a number of additions to the list of invited speakers. Please refer to the web site for the most up-to-date information.

Abstracts will also appear on the web site as they become available.

**Réunion d'été de la SMC 2002**  
**Université Laval**  
**Québec (Québec)**  
**15-17 juin 2002**

**Mise à jour du programme**

Vous trouverez l'information la plus récente sur les programmes, y compris les horaires et le formulaire d'inscription électronique, à l'adresse Web suivante :

<http://www.smc.math.ca/Events/summer02/indexf.html>

Les formulaires d'inscription et de réservation d'hôtel seront aussi publiés dans le numéro de février 2002 des *Notes de la SMC*. Vous les trouverez également sur notre site web, ainsi que les formulaires de résumés de conférences.

**Liste de conférenciers**

Il y a eu quelques additions à la liste de conférenciers. Veuillez consulter le site Web pour l'information la plus récente.

Les résumés de conférences paraîtront sur le site dès que nous les recevrons.

**Mathematics and Statistics**  
**University Faculty Award**

Concordia University's Department of Mathematics and Statistics invites applications for an NSERC University Faculty Award (UFA) for the Fall 2002 competition.

University Faculty Awards are limited to women and Aborigines who have not previously held a tenure-track appointment at a Canadian university.

Candidates must hold a Ph.D. degree in mathematics or a related field, or expect to have completed their degree requirements by the date of appointment. Relevant post-doctoral experience is an asset. Candidates must have a productive research record and excellent teaching skills, as the recipient will be expected to carry out undergraduate and graduate teaching and research. The Department's primary fields of research include Actuarial Mathematics & Statistics, Analysis, Dynamical Systems, Mathematical Physics & Differential Geometry, and Number Theory & Computational Algebra.

The holder will be appointed at the Assistant Professor level (tenure-track).

Interested candidates must submit a curriculum vitae with statements of their teaching philosophy and research interests, at least three letters of reference, and copies of three of their most important research publications to:

Dr. Hershy Kisilevsky, Chair  
 Department of Mathematics & Statistics  
 Concordia University, 7141 Sherbrooke  
 Street West, suite HB-200  
 Montreal, Quebec  
 H4B 1R6

**Review of applications will begin on August 1, 2002 and continue until the position is filled.**

The position is subject to budgetary approval and the success of the application to NSERC.

*All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority.*

*Concordia University is committed to Employment Equity and encourages applications from women, aboriginal peoples, visible minorities and disabled persons.*



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## A Hundred-dollar, Hundred-digit Challenge

by Nick Trefethen, Oxford University.

*This article originally appeared in SIAM News, vol 35, Jan/Feb 2002*

Each October, a few new graduate students arrive in Oxford to begin research for a doctorate in numerical analysis. In their first term, working in pairs, they take an informal course called the “Problem Solving Squad.” Each week for six weeks, I give them a problem, stated in a sentence or two, whose answer is a single real number. Their mission is to compute that number to as many digits of precision as they can.

Ten of these problems appear below. I would like to offer them as a challenge to the SIAM community. Can you solve them? I will give \$100 to the individual or team that delivers to me the most accurate set of numerical answers to these problems before May 20, 2002. With your solutions, send in

a few sentences or programs or plots so I can tell how you got them. Scoring will be simple: You get a point for each correct digit, up to ten for each problem, so the maximum score is 100 points.

Fine print? You are free to get ideas and advice from friends and literature far and wide, but any team that enters the contest should have no more than half a dozen core members. Contestants must assure me that they have received no help from students at Oxford or anyone else who has already seen these problems.

Hint: They’re hard! If anyone gets 50 digits in total, I will be impressed. The ten magic numbers will be published in the July/ August issue of SIAM News, together with the names of winners and strong runners-up.

### The Hundred-dollar, Hundred-digit Challenge Problems

1. What is  $\lim_{\epsilon \rightarrow 0} \int_{\epsilon}^1 x^{-1} \cos(x^{-1} \log x) dx$  ?
2. A photon moving at speed 1 in the  $x$ - $y$  plane starts at  $t = 0$  at  $(x, y) = (0.5, 0.1)$  heading due east. Around every integer lattice point  $(i, j)$  in the plane, a circular mirror of radius  $1/3$  has been erected. How far from the origin is the photon at  $t = 10$  ?
3. The infinite matrix  $A$  with entries  $a_{11} = 1$ ,  $a_{12} = 1/2$ ,  $a_{21} = 1/3$ ,  $a_{13} = 1/4$ ,  $a_{22} = 1/5$ ,  $a_{31} = 1/6$ , etc., is a bounded operator on  $\ell^2$ . What is  $\|A\|$  ?
4. What is the global minimum of the function  $\exp(\sin(50x)) + \sin(60e^x) + \sin(70 \sin(x)) + \sin(\sin(80y)) - \sin(10(x+y)) + \frac{1}{4}(x^2 + y^2)$  ?
5. Let  $f(z) = 1/\Gamma(z)$ , where  $\Gamma(z)$  is the gamma function, and let  $p(z)$  be the cubic polynomial that best approximates  $f(z)$  on the unit disk in the supremum norm  $\|\cdot\|_{\infty}$ . What is  $\|f - p\|_{\infty}$  ?
6. A flea starts at  $(0, 0)$  on the infinite 2D integer lattice and executes a biased random walk: At each step it hops north or south with probability  $1/4$ , east with probability  $1/4 + \epsilon$ , and west with probability  $1/4 - \epsilon$ . The probability that the flea returns to  $(0, 0)$  sometime during its wanderings is  $1/2$ . What is  $\epsilon$  ?
7. Let  $A$  be the  $20,000 \times 20,000$  matrix whose entries are zero everywhere except for the primes  $2, 3, 5, 7, \dots, 224737$  along the main diagonal and the number 1 in all the positions  $a_{ij}$  with  $|i - j| = 1, 2, 4, 8, \dots, 16384$ . What is the  $(1, 1)$  entry of  $A^{-1}$  ?
8. A square plate  $[-1, 1] \times [-1, 1]$  is at temperature  $u = 0$ . At time  $t = 0$  the temperature is increased to  $u = 5$  along one of the four sides while being held at  $u = 0$  along the other three sides, and heat then flows into the plate according to  $u_t = \Delta u$ . When does the temperature reach  $u = 1$  at the center of the plate?
9. The integral  $I(\alpha) = \int_0^2 [2 + \sin(10\alpha)] x^{\alpha} \sin(\alpha/(2-x)) dx$  depends on the parameter  $\alpha$ . What is the value  $\alpha \in [0, 5]$  at which  $I(\alpha)$  achieves its maximum?
10. A particle at the center of a  $10 \times 1$  rectangle undergoes Brownian motion (i.e., 2D random walk with infinitesimal step lengths) till it hits the boundary. What is the probability that it hits at one of the ends rather than at one of the sides?

*Solutions should be sent to Nick Trefethen at Oxford University (LNT@comlab.ox.ac.uk), no later than May 20, 2002.*

## RESEARCH NOTES

Noriko Yui, Column Editor

### Killam Fellowships Awarded

Thirty-three outstanding Canadian researchers have been awarded a total of \$2.54 million in the 34th annual competition for Killam Research Fellowships, administered by the Canada Council for the Arts.

Among Canada's most distinguished research awards, the Canada Council for the Arts Killam Research Fellowships are made possible by a bequest of Mrs. Dorothy J. Killam and a gift she made before her death in 1965. The awards support scholars engaged in research projects of outstanding merit in the humanities, social sciences, natural sciences, health sciences, engineering and interdisciplinary studies within these fields.

Killam Research Fellowships enable Canada's best scientists and scholars to devote two years to full-time research and writing. The recipients are chosen by the Killam Selection Committee, which comprises 16 eminent scientists and scholars representing a broad range of disciplines.

After considering 82 applications, the Killam Selection Committee chose 17 researchers as new Killam Research Fellows for 2002, including two in Mathematics:

**Oleg Bogoyavlenskij** (Queen's University)  
Symmetries and Invariants in Dynamics and Plasma Equilibria

**Victor Ivrii** (University of Toronto)  
Sharp Spectral Asymptotics for Operators with Irregular Coefficients

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## CMS ANNUAL REPORTS FROM COMMITTEES

*Editorial Note: The following were edited from the 2001 Annual Reports of the Society's Standing Committees. The Treasurer's Report will appear in the September issue of the Notes.*

### Advancement of Mathematics

**Jonathan Borwein (Simon Fraser) Chair**

**Christiane Rousseau (Montréal)**

**Georg Schmidt (McGill)**

**F. Arthur Sherk (Toronto)**

**J. Whitfield (Lakehead)**

**Edgar Williams (Memorial)**

**Robert Woodrow (Calgary)**

**Graham P. Wright (Ottawa)**

One of the consequences of the CMS Taskforce review was the decision to reorient fundraising as a subcommittee (primarily ex-officio) of a new Advancement of Mathematics Committee (AMC). As in 2000, Fundraising was not as successful in 2001 as had been anticipated, in part because of continued unexpected calls on the Executive Director's time and because of the downturn in the economy. The stabilization of CMS publishing activities and the Executive Director's new contract both offer better prospects in 2002. That said, it is my view – as both chair of the AMC and as President of the Society – that our fund raising initiatives are not treated seriously enough. The future health of the CMS relies in some mixture of:

(i) preserving and defending our revenue stream from publications;

(ii) initiating and concluding a successful and continuing membership drive, especially in Quebec and with younger

academics;

(iii) assuring adequate paying attendance at conferences;

(iv) greater success in raising funds from the private and public sector.

All four of these issues have to become much better enmeshed with the Society's annual cycle. The AMC, in addition to more broadly discussing issues such as the relationship between the Society, the three Institutes (Fields, CRM and PiMS), MITACS and BIRS, has initiated such an annual cycle.

It will take vigilance on all parts to successfully integrate these activities.

That said, in 2001 a total of \$165,652, was raised from grants and donations; and a more ambitious national fundraising protocol was initiated. It is anticipated that the Vice-Presidents will play a more prominent role than in the past.

More broadly, various subcommittees (Education and Research included) have been asked to reconsider the structure of our two annual meetings and to position us as well as possible for a changing future, especially given the funding of BIRS. They have also been asked to review the terms and conditions of our prizes and prize lectures.

Four exciting initiatives were undertaken, consonant with 'Advancement of Mathematics': (i) a series of National Educational Fora commencing in May 2003 (see [www.cms.math.ca/bulletins/NEF.html](http://www.cms.math.ca/bulletins/NEF.html)). Their aim is in part to allow the CMS to play a leadership role in educational

activities;

(ii) a first joint France-Canada meeting in Toulouse in July 2004;

(iii) a reception will be held at the Canadian Embassy in Beijing (August 2002) to celebrate the awarding of the Fields Medals during the 2002 International Congress of Mathematicians;

(iv) a full-scale reorganization of publishing for the period 2003-2007 – to assure an up to date publishing environment and a reasonable revenue stream while not over stressing our wonderful but limited human resources.

## Education

**Edward Barbeau (Toronto) Chair**

**Jacques Bélair (Montréal)**

**John Grant McLoughlin (Memorial)**

**Bernard Hodgson (Laval)**

**Jennifer Hyndman (UNBC)**

**Andrew Liu (Alberta)**

**Abraham Punnen (UNBSJ)**

**Ross Willard (Waterloo)**

The main activity of the Committee is to ensure that there are educational sessions at each semi-annual meeting of the Society. At the June 2001 CMS meeting in Saskatoon, Florence Glanfield and Keith Taylor organized a session on the theme "Cognition in Mathematics", that was open to secondary teachers as well as to members of the Society. The plenary speaker was DeWitt Sumners (Florida State University), who spoke on mathematics in biology and medicine. At the December 2001 CMS meeting in Toronto, two sessions were organized by Pat Rogers, Kathy Kubota-Zarivnij and Walter Whiteley; both were devoted to posing and answering questions related to teaching and student learning. A number of mathematicians and mathematics educators salted the discussion with brief interventions before discussion was opened to the floor. David Pimm (Alberta) delivered a plenary address on "Interactions between language and mathematics; fluency, understanding and time".

The Education Committee is charged with the task of selecting the recipient of the Adrien Pouliot Award, which recognizes achievement in mathematics education. The 2001 recipient was to George Bluman, currently Head of the Department of Mathematics at the University of British Columbia. He has made significant contributions over thirty years at both the secondary and university levels. In particular, he organized many sessions for school students across British Columbia.

In addition, the Education Committee awarded grants in support of contests held in Alberta, Manitoba, Northern Ontario, Quebec, the Maritime provinces and Newfoundland.

At the annual Canada Wide Science Fair in Kingston (May, 2001), the Chairman was on hand together with Su-

san Cooper and Morris Orzech from Queen's University and Pierre Gravel, Lucien Haddad and David Wehlauf from the Royal Military College. We selected the winners of the three special awards given by the Society. The senior prize was awarded to Robyn Maler, the intermediate prize to Yichuan Wong and the junior prize to Mahmoud Bazargan. In the future, the Society, in conjunction with other professional organizations, hopes to produce materials that might provide ideas to students and teachers, and give them a sense of the standards required for a good exhibit.

At its meeting in Saskatoon in June, 2001, the Committee emphasized the desirability of attracting students into teaching while they are yet mathematics undergraduates and permitting them to have experience in the classroom. There is a continuing need to disseminate mathematics related career information, and probably the most productive work of the Committee, in the future, will be through the Society's web site.

## Electronic Services

**Jason Brown (Dalhousie) Chair**

**Peter Borwein (SFU)**

**Edgar Goodaire (Memorial)**

**Laurent Marcoux (Alberta)**

**David Rodgers (Argus Associates)**

**Gail Wolkowicz (McMaster)**

**Christiane Rousseau (Montréal)**

The Electronic Services Committee of the Canadian Mathematical Society oversees the Society's electronic operations and serves as an advisory board to the Director of Electronic Products and Services. It monitors the CMS web site (Camel) and recommends changes when and as necessary. The Committee's responsibilities are considerable because almost every area of concern to the CMS is affected by and makes use of modern technology, from the Executive Office to publications, research, education and outreach.

The Committee considers that the CMS is extremely fortunate, effective July 1, 2001, to have Alan Kelm working as the full-time Manager for the CMS web site. The redesign of the CMS web site has proceeded under Alan's guidance and with the help of excellent part-time student assistance. The new design is much easier to navigate and more attractive. As well, migration of the western services of Camel eastward is continuing, and it is hoped that it will be complete in 2002. The day-to-day management of the web site is under the Director of Electronic Services (Graham Wright) and, in 2001, only occasional issues of policy were brought to the attention of the ESC.

There was some discussion of "password caching" to deal with the frustration of CMS members who forget their passwords. The simplicity of automatically emailing of passwords



was supported, provided that security of the process can be maintained.

Unfortunately, it has become apparent that the project from APuRL (a digital publishing research group in Vancouver), which would integrate all aspects of the CMS publishing enterprise into a single "vortal", will not be completed, though there may be some integration of modules into the structure of the CMS publications protocols.

My term as Chair of this committee began on January 1, 2001, and I would like to extend my appreciation to the previous chair, Edgar Goodaire, for his support. As well, I would like to thank the other members of the committee for making my first term as chair of this committee enjoyable and productive.

## Endowment Grants

### James Timourian (Alberta) Chair

**George Bluman (UBC)**

**Lisa Jeffrey (Toronto)**

**Thomas Ransford (Laval)**

**Richard Wood (Dalhousie)**

Twelve applications were received for the 2001 Endowment Grants Competition. A total of 8 were received using our online HTML form. The remaining applications were received as e-mail attachments in either Word or Latex.

The total amount applied for was \$130,800 and the Endowment Grants Committee (EGC) was allotted \$60,000 to grant. Unlike in past years (1999 and 2000), all of the money allocated was awarded.

The EGC made an unusual decision in the case of one application: we decided to make an award for the second year of the program, subject to additional financing being obtained for the first year.

Applicants have been unofficially notified of the results by e-mail, and official letters sent from the Executive Office in Ottawa. Successful applications can be viewed on the web at:

<http://www.cms.math.ca/Grants/EGC/>.

Once a proposal is funded, the applicants are obligated to report on how things turned out. Not all of the reports that were due in 2001 have been received, but when they are received they will appear on the web and extracts published in the CMS Notes.

The Endowment Grants Program is now three years old and the enabling resolutions called for a review at the end of this period. The new Chair of the Endowment Grants Committee (Kathryn Hare) will take over in January 2002. As part of the review process, as outgoing Chair, I will be submitting a report on the Committee's experience over the past three years. In addition, the opinions of successful and unsuccessful applicants, past and present committee members as well as those who have worked with the program should be sought

for a thorough review of the process and the benefits of the Endowment Grants Program.

## Finance

### Ian Goulden (Waterloo) Chair

**Timothy Appelt (Structured Analytics)**

**David Bates (Maritime Life)**

**Jonathan Borwein (SFU)**

**Michael Lamoureux (Calgary)**

**Christiane Rousseau (Montréal)**

**F. Arthur Sherk (Toronto)**

**Graham P. Wright (Ottawa)**

The Finance Committee includes among its members the Treasurer, the Executive Director, the President, and the Past-President or the President-Elect. The Committee is responsible for the overall financial activities of the Canadian Mathematical Society, including the annual budget and the Restricted Investment Funds – the Endowment Fund, the Mathematical Olympiad Fund and the Designated Activities Fund. The Treasurer's Report provides details of the 2001 financial year and the 2002 Budget.

There have been some difficulties in finding a suitable person to fill the full-time CMS Accountant position but it is expected the position will be filled in early 2002.

The Society's Restricted Investment Funds continue to be managed by Toronto Dominion Quantitative Capital, wholly in indexed funds. Thus, for example, no decisions on individual equities are required. Instead, only the mix between funds is considered, periodically.

After a review of the current economic situation, and taking into account the opinions of our internal and external consultants, the Finance Committee recommended, and the CMS Board of Directors (December 2001) agreed to, change the asset mix to 40% Bonds, 10% Canadian Equities and 50% Global Equities. The Global Equity portion contains about 60% US Equities. The Society has been greatly helped in such discussions by our two consultants, Tim Appelt and David Bates, both of whom have substantial professional expertise in the financial world.

## Human Rights

### Paul Gauthier (Montréal) Chair

**Zhiguo Hu (Windsor)**

**Robert van Den Hoogen (St. Francis Xavier)**

Unlike previous years, no human rights violations of mathematicians were reported to the CMS Human Rights Committee in 2001.

The question was raised as to whether the Committee should be considering issues regarding discrimination against women mathematicians, but since the CMS has a committee on Women in Mathematics, it was felt that the Human Rights

Committee should not discuss this issue unless the committee on Women in Mathematics requested help on some specific topic. The question was also raised as to whether we should be considering race issues, but no conclusions were arrived at. Moreover, no cases were presented to us.

Following the CMS Taskforce review, in December 2001, the Board of Directors decided to abolish the Human Rights Committee but create the position of a Human Rights Officer whose mandate is similar to the previous terms of reference of the Human Rights Committee.

## International Affairs

### **Peter Fillmore (Dalhousie) Chair**

**Niky Kamran (McGill)**

**Edwin Perkins (UBC)**

**Bernard Hodgson (Laval)**

**Thomas Salisbury (York)**

**Catherine Sulem (Toronto)**

**Nicole Tomczak-Jaegermann (Alberta)**

**Robert Miura (UBC)**

Hodgson's term began in July, and the terms of Fillmore, Miura and Tomczak-Jaegermann ended at the end of 2001.

During 2001, most committee business was concerned with preparations for the upcoming International Congress of Mathematicians, ICM 2002, which will take place August 20-28 in Beijing.

At the beginning of the year, the Committee sent Yuri Manin, Chair of the Program Committee for ICM 2002, a list of potential Canadian speakers. Subsequently the IAC discussed ways to improve the process for the next ICM. The Committee recommended that the CMS make a donation to the IMU's Special Development Fund (to assist mathematicians in developing countries). We oversaw the compilation of Canadian data for the 12th edition of the World Directory of Mathematicians, which is revised in advance of each ICM. The primary source of information is university departments, which in a number of cases failed to respond to repeated requests.

The Committee met during the Winter 2001 Meeting in Toronto. The main items of discussion were a nomination to the Executive Committee (EC) of the IMU and the composition of the Canadian delegation to the IMU General Assembly, which will meet in Shanghai in August 2002. Jim Arthur was a member of the EC from 1990 to 1998. Although there is currently no Canadian member of the EC, Bernard Hodgson is the Secretary of ICMI, and the Secretariat is located at Laval.

## Mathematical Competitions

### **Daryl Tingley (UNB) Chair**

**Edward Barbeau (Toronto)**

**George Bluman (UBC)**

**Peter Cass (Western)**

**Peter Crippin (Waterloo)**

**Luis Goddyn (Simon Fraser)**

**Richard Nowakowski (Dalhousie)**

**Bill Sands (Calgary)**

**Christopher Small (Waterloo)**

**Jean Turgeon (Montréal)**

**Graham P. Wright (Ottawa)**

The Mathematical Competitions Committee (MCC) of the CMS is responsible for overseeing activities associated with the Society's involvement in mathematics contests. Two contests, the Canadian Open Mathematics Challenge (COMC) and the Canadian Mathematical Olympiad (CMO) are sponsored and run by the Society. The MCC is also responsible for Canada's participation in the Asian Pacific Mathematics Olympiad (APMO) and the International Mathematical Olympiad (IMO). Other activities of MCC include the Mathematical Olympiads' Correspondence Program, and Mathematics Camps.

Much of the work of the MCC is done by its three subcommittees, namely the Canadian Open Mathematics Challenge Committee, the Canadian Mathematical Olympiad Committee and the International Mathematical Olympiad Committee. Further information, including press releases, on most of the topics in this report can be found through the CMS Competitions web page ([www.cms.math.ca/Competitions/](http://www.cms.math.ca/Competitions/)).

### **The Canadian Mathematical Olympiad**

The 33rd Canadian Mathematical Olympiad (CMO) took place on April 5th, 2001. The top three students were :

Daniel Brox, Sentinel Secondary School, West Vancouver, BC; Roger Mong, Don Mills Collegiate Institute Toronto, Ont; and Nima Kamoosi, West Vancouver Secondary School, West Vancouver, BC.

Prizes for the CMO were awarded at the CMO Banquet. The Banquet was held at Renison College, on the Campus of the University of Waterloo. At the Banquet, Daniel, Roger, and Nima were awarded prizes of \$2000, \$1500 and \$1000 respectively. In addition, Daniel Brox was presented with the Sun Life Cup, and all winners received book prizes, donated by John Wiley & Sons and Nelson Thomson Learning. Daniel Brox also won the First Prize in 2000. He is the fourth person to have won consecutive First Prizes in the 33 years of the CMO. More information about the 2001 CMO is available at:

[www.cms.math.ca/Competitions/CMO/](http://www.cms.math.ca/Competitions/CMO/)

and the CMO report is also available from the CMS Executive Office.

### **The Asian Pacific Mathematics Olympiad**

The 2001 Asian Pacific Mathematics Olympiad (APMO) was written in March by 39 Canadian students, selected either because they had participated in the Mathematical Olympiads Correspondence Program or because they had placed well in the 2000 Canadian Open Mathematics Challenge. Unfortunately the results of the 2001 APMO were nullified as some

of the problems were posted on an internet site before other countries had written the paper. Furthermore, at least one country became aware that their students had access to the problems via email. Since there was absolutely no indication Canadian students were implicated in this unfortunate event, the name of the top four Canadian students are given:

Roger Mong, Daniel Brox, Shu Niu, and Nima Kamoosi.

At the 2000 International Mathematical Olympiad, Canada was asked to be the Chief Coordinating Country for the APMO, commencing in 2002. At the 2001 CMS Summer Meeting, Bill Sands (Calgary) was appointed the Chair of an ad-hoc committee charged with the responsibility of organizing the APMO for the three years (2002 to 2004). The other members of the ad-hoc committee are Andy Liu (Alberta), Richard Hoshino (Dalhousie), Christopher Small (Waterloo) and Edward Wang (Wilfrid Laurier).

#### **The International Mathematical Olympiad**

Canada's 2001 International Mathematical Olympiad Team was announced on June 6. It consisted of:

Daniel Brox, Sentinel Secondary School, Vancouver; Paul Cheng, West Vancouver Secondary School, West Vancouver, BC; Liang Hong, University of Toronto Schools, Toronto, Ont; Nima Kamoosi, West Vancouver Secondary School, West Vancouver, BC; Roger Mong, Don Mills Collegiate Institute Toronto, Ont; and Shu Niu, Port Moody Secondary School, Port Moody, BC.

The 2001 team was accompanied by the Team Leader, Dr. Christopher Small (Waterloo); the Deputy Team Leader, Dr. Dorette Pronk (Dalhousie University); the Leader Observer, Dr. Edward Wang (Wilfrid Laurier University); and the Deputy Leader Observer, Mr. Richard Hoshino (Waterloo).

The 42nd International Mathematical Olympiad (IMO) was held in Washington DC, USA from July 1 to July 14, 2001, with 83 countries participating. At the Awards Ceremony on July 13th, 2001 in Washington, a Gold Medal was awarded to Daniel Brox and Bronze Medals to Paul Cheng, Liang Hong, Nima Kamoosi and Roger Mong. More information is available at [www.cms.math.ca/Communiques/](http://www.cms.math.ca/Communiques/) or [www.cms.math.ca/Competitions/](http://www.cms.math.ca/Competitions/).

#### **IMO Training Camps**

Two training camps are held each year to prepare students for the annual IMO. The CMS Winter IMO Training Camp, held in January, is used to begin the training for the IMO and to let the team leaders meet those students who have a good chance of making the IMO team. The CMS Summer IMO Training Camp is used for intensive training of the actual IMO team.

The 2001 Winter IMO Training camp took place at York University from January 3 to January 7. Students were selected for the camp on the basis of their work in the Mathematical Olympiads Correspondence Program (below) and their performance on a time limit examination (TLE) which

is organized by Richard Nowakowski (Dalhousie). The purpose is to give some indication of a student's performance in a competition like setting. The students write the TLE at their home. They have a total of 6 hours, over two sessions, to do a total of 8 problems. This year, 34 students participated in the TLE.

The 2001 Winter IMO Training Camp featured a group of 15 students from across the country as well as a team of trainers and support people, including the team leaders Christopher Small, Edward Wang, Dorette Pronk and Richard Hoshino, and myself. Tom Salisbury, Chair of the Department of Mathematics at York University, was the local organizer and he also took an active part in the training. Other individuals who provided invaluable assistance were Walter Whiteley (York) Ed Barbeau (Toronto) and Bill Sands (Calgary—Chair of the CMS IMO Committee).

The 2001 Summer IMO Training camp was held at The University of New Brunswick (UNB) from June 17 to July 1. The trainers were: Christopher Small, Edward Wang, Dorette Pronk, Richard Hoshino, Barry Monson (UNB), Roman Mureika (UNB) and myself. Three local students attended the camp for the first 2 days. Some of the highlights of the camp, (not including all the mathematics of course) were a media reception (June 18), lunch with the Lieutenant Governor of New Brunswick, the Honorable Marilyn Trenholm-Consell, (June 20), as well as several bowling trips and movies. The team left Fredericton on July 1 with the Leader and Leader Observer headed for Washington and the others for Toronto. The team members from Toronto spent a couple of days at home, while those from Vancouver stayed at the home of Richard Hoshino. On July 3, 2001, the students and the deputy leaders also left for Washington.

#### **Mathematical Olympiads' Correspondence Program**

The Mathematical Olympiads' Correspondence Program (MOCP) is a problems based correspondence program. It is intended for Canadian (or Permanent Resident) high school students with exceptional mathematical ability and who wish to pursue mathematical problem solving at a high level and/or have ambitions to compete in mathematical olympiads. Dr. Edward Barbeau has been the Coordinator of this program for many years. In 2001, he was assisted by Dr. Dragos Hrimiuc (Alberta) and Dr. Valeria Pandelieva from Ottawa. Problem sets are sent each month to the students. Students have six weeks to return solutions. The solutions are then marked and returned (with copious comments) to the students. Currently, about 40 students are actively participating in the program.

#### **ESSO Math Camps**

The Imperial Oil Charitable Foundation has generously agreed to be the Title sponsor of a series of "ESSO Math Camps".

During June 16-23, 2001 the fourth annual CMS National Math Camp took place at Huron College (on the Campus of the

University of Western Ontario) with 23 students from across the country in attendance. The camp was organized and run by Tom Griffiths, Marlene Griffiths, Richard Hoshino, Jean Collins, and Jeff Shiffrin and Paul Ottaway. A detailed report is available.

In addition to the National Math Camp, Regional ESSO Math Camps were held at the following universities:

Dalhousie University, The University of New Brunswick, Brock University, Simon Fraser University, Wilfred Grenfell College, The University of Western Ontario, The University of Ottawa (two camps, one French one English), The University of Regina, The University of Calgary.

The format and length of these camps varied considerably: from 2 day non-residential to 6 day residential camps. Detailed reports for these camps are available from the CMS Executive Office.

That all of the above institutions plan to hold camps again in 2002 is an indication of their considerable success. Furthermore, in 2002, there will be two new camps: one at the University of Prince Edward Island, and one at the University of Manitoba.

#### **The Canadian Open Mathematics Challenge (COMC)**

The COMC is a contest written each year at the end of November. Although it is the last MCC event of the calendar year, and hence of this report, it is the first scheduled MCC event of the academic year. The COMC provides mathematical enrichment for a large number of students and serves as a qualifying paper for the Canadian Mathematical Olympiad (CMO). The results are also used in the selection process for students to the IMO winter training camp. Plaques are awarded to both the students and schools for being a provincial or regional winner and Gold Medals are awarded to up to 9 other students in each province or region.

The Fifth COMC was held on November 29, 2001. About 4500 students participated. For a list of the regional and provincial winners, please see:

[www.cms.math.ca/Competitions/COMC/](http://www.cms.math.ca/Competitions/COMC/) or  
[www.cms.math.ca/Communiques/](http://www.cms.math.ca/Communiques/).

The COMC is going well and both schools and provincial governments seem to like the opportunity to see how their top students fair on a national basis. The Society's increased interest in students (including the COMC and Math Camps) is reaping significant rewards.

#### **Thanks**

As I hope this report shows, the MCC is a very active committee. I wish to thank all of the members of the MCC and its subcommittees for their time and effort. As many know, the CMS is a society of volunteers. Members of the MCC contribute large amounts of time to make our events run smoothly. I must also thank the staff of the CMS Executive Office and the Executive Director, Graham Wright. They perform much of the administrative work for the MCC and its sub-committees and ensure seamless transition as chairs and

membership changes.

## **Nominating**

### **Catharine Baker (Mount Allison) Chair**

**Jonathan Borwein (Simon Fraser)**

**Steven Boyer (UQAM)**

**Kenneth Davidson (Waterloo)**

**Richard Kane (Western) to June 2001**

**Anthony Lau (Alberta)**

**Barry Monson (UNB)**

**Christiane Rousseau (Montréal) from June 2001**

The Committee supervised the 2001 election of Officers and Board members. A total of 21 candidates contested the 5 Executive and 11 Board positions; 214 ballots were cast, of which 3 were declared invalid. We would like to thank Michel Racine, Barry Jessup and Graham Wright for acting as Tellers for the election and all the candidates who let their names stand. The results, which follow, were announced at the Annual General Meeting in June in Saskatoon.

President-Elect (2001-2)

President (2002-4)

Past-President (2004-5): Christiane Rousseau (Montreal)

Vice Presidents (2001-3):

West—George Bluman (UBC)

Ontario—James Mingo (Queen's)

Quebec—Bernard Hodgson (Laval)

Atlantic—Edgar Goodaire (Memorial)

Board of Directors (2001-5):

West—Malgorzata Dubiel (SFU), Laurent Marcoux (Alberta),

Ortrud Oellermann (Winnipeg)

Ontario—Richard Caron (Windsor), Kathryn Hare (Waterloo),

Damien Roy (Ottawa)

Quebec—Galia Dafni (Concordia), Tomasz Kaczynski (Sherbrooke)

Atlantic—Gordon MacDonald (UPEI), Abraham Punnen (UNBSJ)

At large—Michael Overton (Courant)

The Nominating Committee recommended several changes to various standing committees.

The Committee, in consultation with the Executive Committee and the Fund Raising Committee, proposed the formation of a new Advancement of Mathematics Committee to oversee the overall activities of the Society for the advancement and development of mathematics, including outreach, publicity, fund-raising and other promotional activities. The Terms of Reference for this committee were approved by the Board in June 2001.

The Committee, in consultation with the Student Committee, proposed the following changes to the Terms of Reference for the Student Committee: that the Student Alternate positions on the Board of Directors be eliminated, effective at the

end of the term of the current members; that the term of office for student delegates and for non-ex-officio members of the Student Committee normally be for a 2-year period beginning July 1. This was approved by the Board in December 2001.

The Committee, in consultation with the Executive Committee and the Chair of the Human Rights Committee, proposed that the Human Rights Committee be discontinued, effective December 31, 2001, that the position of Human Rights Officer be established with Terms of Reference that were approved at the December 2001 Board meeting.

The Nominating Committee recommended that the Terms of Reference for the CMS Standing Committees (excluding the International Affairs Committee and the Nominating Committee) be amended so that an individual would be appointed as Chair-Elect for one year followed by two years as Chair. This was approved at the December 2001 Board meeting.

In addition, the Committee nominated twenty-seven individuals to chair or to fill vacancies on various standing committees, to fill a vacant position on the Board and to serve as Treasurer of the Society.

The terms of Steve Boyer, Ken Davidson, Anthony Lau and Catharine Baker ended on December 31, 2001. Richard Kane left the Committee in June when his term as Past President ended. We thank them all for their service on the Committee.

## Publications

**Keith Taylor (Saskatchewan) Chair**

**Edgar Goodaire (Memorial)**

**Peter Hoffman (Waterloo)**

**James Mingo (Queen's)**

**Christine Soteros (Saskatchewan)**

**Anthony Thompson (Dalhousie)**

The Publications Committee oversees the publishing activities of the Society. The publications of the Society together with the respective editors-in-chief are:

- The Canadian Journal of Mathematics (Henri Darmon and Niky Kamran),
- The Canadian Mathematical Bulletin (James Lewis, Arturo Pianzola and Noriko Yui),
- Crux Mathematicorum with Mathematical Mayhem (Bruce Shawyer),
- CMS Book Series (Jonathan Borwein and Peter Borwein),
- CMS Tracts in Mathematics (Keneth Davidson and Cameron Stewart),
- CMS Notes (Peter Fillmore and S. Swaminathan),
- A Taste of Mathematics (Anthony Thompson).

The G. de B. Robinson Prize is awarded each year for an outstanding article published in one of the Society's two research journals. In even numbered years, the prize is awarded

for an article published in the Journal and in odd numbered years, for an article published in the Bulletin. The 2001 Prize was awarded to Professor Patrick Gilmer, Louisiana State University, for his article "Topological Quantum Field Theory and Strong Shift Equivalence" Canadian Mathematical Bulletin Vol. 42(2), pp. 190-197.

The following editorial appointments were recommended by the Committee and, where necessary, approved by the Board of Directors.

Scientific Editorial Board for the CJM and CMB: A. Geramita (Queen's), V. Kac (MIT), M. R. Murty (Queen's), M. Zworski (UC Berkeley).

Crux Mathematicorum with Mathematical Mayhem Board: John Grant McLoughlin as Book Review Editor, Shawn Godin as Mayhem Editor and Chris Cappadocia as Mayhem Assistant Editor. Bruce Shawyer's term as Editor-in-Chief ends as of December 31, 2002 and a search for his replacement has begun.

ATOM (A Taste of Mathematics): Anthony Thompson (Dalhousie) was named Editor-in-Chief.

## Research

**Douglas Stinson (McGill) Chair**

**Hermann Brunner (Memorial)**

**Niky Kamran (McGill)**

**James Mingo (Queen's)**

**Ian Putnam (Victoria)**

**Gordon Slade (UBC)**

**Catherine Sulem (Toronto)**

The 2001 Summer Meeting of the CMS was held in Saskatoon, Saskatchewan. The meeting was hosted by the University of Saskatchewan and featured the following research sessions:

Abstract Harmonic Analysis (Org: Anthony Lau, Alberta and Keith Taylor, Saskatchewan); Geometric Topology (Org: Alex Chigogidze and Ed Tymchatyn, Saskatchewan); Graph Theory (Org: Brian Alspach and Denis Hanson, Regina); Infinite Dimensional Lie Theory and Representation Theory (Org: Stephen Berman, Saskatchewan); Mathematical Education Cognition in Mathematics (Org: Florence Glanfield, Saskatchewan); Matrix Analysis (Org: Judith McDonald, Regina); Model Theoretic Algebra (Org: B. Hart, McMaster/Fields, F.-V. Kuhlmann and S. Kuhlmann, Saskatchewan); Number Theory - in Honour of David Boyd (Org: P. Borwein, Simon Fraser and M. Bennett, Illinois Urbana-Champaign); Rigorous Studies in the Statistical Mechanics of Lattice Models (Org: Chris Soteros, Saskatchewan and Stu Whittington, Toronto); Scattering Theory and Integrable Systems (Org: Jacek Szmigielski, Saskatchewan)

The 2001 Krieger-Nelson Lecturer was Lisa Jeffrey, University of Toronto and the 2001 Jeffery-Williams Lecturer was David Boyd, University of British Columbia.

The plenary lectures were given by Georgia Benkart (Wisconsin), Zoe Chatzidakis (Paris 7), Geoffrey Grimmett (Cambridge), and Barry Simon (Caltech).

The 2001 Winter Meeting of the CMS was held in Toronto, Ontario, was hosted by York University and included the following research sessions:

Dynamics and Symmetry (Org: Bill Langford, Guelph and Jianhong Wu, York); Free Probability (Org: Alexandru Nica, Waterloo); History of Mathematics (Org: Richard O'Lander and Ronald Sklar, St. John's University, N.Y.); Industrial Mathematics (Org: Huaxiong Huang, York University); Kac-Moody Lie Theory and Generalizations (Org: Nantel Bergeron, Yun Gao, and Geanina Tudose, York); Mathematical Education (Org: Pat Rogers, Windsor, Kathy Kubota-Zarivnij, and Walter Whiteley, York); Moonshine (Org: Christopher Cummins, Concordia); Nonlinear and Geometric Analysis (Org: Robert McCann and Jochen Denzler, Toronto)

The 2001 Coxeter-James Lecturer was given by Kai Behrend, University of British Columbia and the 2001 Doctoral Prize Lecturer was Nathan Ng, University of Georgia. The plenary lectures were given by Martin Golubitsky (University of Houston), John Ockendon (Oxford University), Arturo Pianzola (University of Alberta), David Pimm (University of Alberta), Richard Schoen (Stanford University), and Dan Voiculescu (University of California, Berkeley).

Looking ahead, the next four meetings of the CMS will be held in Quebec City (Summer 2002), Ottawa (Winter 2002), Edmonton (Summer 2003) and Vancouver (Winter 2003).

The Research Committee has approved four core sessions for the CMS Summer 2003 Meeting, namely; Conformal Field Theory, Infinite Dimensional Dynamical Systems, Applied Harmonic Analysis, and Computational and Analytical Techniques in Modern PDEs and Applications.

The research committee has expressed some concern at the relatively small number of nominations for the prize lectureships that have been put forward in recent years (Doctoral, Jeffery-Williams, Coxeter-James and Krieger-Nelson). Nominations of worthy people are essential to the continued success of the CMS Prize Lectureships; however, a dearth of nominations in the future could lead to undesirable consequences. It is felt that there are many deserving nominees for these prizes, and the Committee encourages the nominations of strong mathematicians from all Canadian mathematics departments.

The Research Committee has discussed ways of improving the accessibility and dissemination of research at the Society's semi-annual meetings. The Committee supports the solicitation of expository papers from plenary speakers and prize lecturers based on the talks that are given at the meetings. Meeting directors are being actively encouraged to emphasize the importance of prize lecturers and plenary speakers giving talks that are truly accessible to a wide audience. Finally, the

inclusion of a session of survey talks (as was done at the St. John's meeting in 1999) was suggested as something to be encouraged in the future.

## Students

### **Daniel Piché (Waterloo) Chair**

**Jean-Phillippe Boulet (Laval)**

**Susan Cooper (Queen's)**

**Gabriella Couto (McMaster)**

**Renato Dedic (Bishop's)**

**Ana Duff (Ottawa)**

**Alexandre Girouard (Montréal)**

**Robert Juricevic (Concordia)**

**Boris Krivulin (Concordia-Loyola)**

**Dave Morgan (Memorial)**

**Lindsey Shorser (Toronto)**

**Robert Woodrow (Calgary)**

**Graham P. Wright (Ottawa)**

This is the third annual report of the Student Committee. The Committee is responsible for all aspects of mathematics student affairs. Information on the goals of the Committee and its membership can be found on the CMS web site: [www.cms.math.ca/Students](http://www.cms.math.ca/Students)

#### 1. Change of membership.

The Committee underwent its first change in membership since its inception in 1999. The outgoing members were Tullia Dymarz, Benoit Charbonneau and Andrew Irwin. Incoming members were Ana Duff (Regional Rep), Renato Dedic (Regional Rep) and Boris Krivulin (Student Webmaster). The other Committee members stayed on for an extra year to provide continuity to the Committee's activities.

#### 2. Maintaining a student web site

([www.cms.math.ca/Students](http://www.cms.math.ca/Students)).

The site contains the Committee newsletter, calendar of events, local activities, grant applications, information on the CUMC, job postings, and a number of other items of interest to mathematics students. Contributions from the community are appreciated.

#### 3. Publishing a national student newsletter.

The first two editions of the student newsletter *Student Communicator* were published in 2001 (March and October). The newsletters were developed by the Student Editor (Robert Juricevic) with contributions from students in universities across the country and even one article from France. Multiple copies were sent to each math department across the country. The *Communicator* may be found online at:

[www.cms.math.ca/Students/en/Newsletter/](http://www.cms.math.ca/Students/en/Newsletter/)

#### 4. Graduate Student Events.

The Committee organised a social event for graduate students at each of the CMS meetings in 2001. The events were well enjoyed by those attending and it is the Committee's plan to continue organising such events in the future.

5. Providing funding to various regional student events.

Three events were funded in 2001: the IAM-CSC-PIMS Undergraduate Math Modelling Workshop, the ISM Graduate Student Conference and the APICS conference. An amount of \$150 was given to each group.

6. Sponsoring the CUMC.

As an ongoing initiative, the Committee provided funding in the amount of \$1,000 towards the organising of CUMC 2001. The conference was held at Laval University in July over a period of five days. It was well attended and photos from the conference can be seen at:

[www.cumc.math.ca/2001](http://www.cumc.math.ca/2001).

CUMC 2002 will be held July 2 to 7 at the University of Calgary (see [www.cumc.math.ca](http://www.cumc.math.ca)). The Committee is also assisting the CUMC in planning its future and enabling its continuity through the development of an operations manual for its organisers. The operations manual is still in development at this time. The webmaster is also developing a new architecture for the CUMC site, including a registration system and database.

7. CUMC Proceedings.

The Committee is continuing efforts to develop a system to create annual proceedings for the CUMC. To this end, the Committee appointed Drew Vandeth as CUMC Proceedings Editor. The Editor has been working on the CUMC 2001 proceedings over the past months, compiling students' papers and developing a format for the proceedings. The goal is to have printed proceedings in a standard scientific format to allow students presenting at the CUMC to publish a first paper. The Editor's plan is therefore to solicit departments to purchase one copy of the proceedings for their libraries to fund its printing.

The Committee also met at each of the CMS meetings to discuss ongoing initiatives and develop future goals and projects.

## Women in Mathematics

**Malgorzata Dubiel (Simon Fraser) Chair**

**George Bluman (UBC)**

**Rob Corless (Western)**

**Chantal David (Concordia)**

**June Lester (UNB)**

**Neal Madras (York)**

**Frank Zorzitto (Waterloo)**

The Committee on Women in Mathematics is charged with monitoring the status of women within the Canadian mathematical community and the Society, recommending and initiating actions which will ensure equitable treatment of women, and with encouraging the participation of women in mathematics at all levels.

The Committee continues to maintain the Directory of Canadian Women in the Mathematical Sciences: a collection of web pages of Canadian women who are actively involved in research or studies in mathematics, or any other aspects of mathematical sciences. The Directory is a valuable source for information about Canadian women mathematicians.

The poster featuring the first six winners of the CMS Krieger-Nelson Prize finalized at the end of 2000, was distributed to all high schools, universities and colleges in Canada, to present these women as role models for female students.

The committee has initiated discussions with the members of the Student Committee to investigate the concerns of female graduate students. The talks led to the idea of organizing a conference for female graduate students in mathematics, focussed on networking, career strategies and other areas of interest. The conference is planned to take place in Edmonton, prior to the 2003 CMS Summer Meeting.

In June 2001, George Bluman (UBC) replaced Keith Taylor (Saskatchewan) as the President's Delegate. June Lester (UNB/SFU) and Frank Zorzitto (Waterloo) ended their terms as of December 31, 2001. I will be continuing as the Chair for a further two years and Leah Edelstein-Keshet (UBC) and Dorette Pronk (Dalhousie) will join the Committee in January 2002.

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## Letters to the Editors/Lettres aux Rédacteurs

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

Les rédacteurs des *Notes* acceptent les lettres en français ou en anglais portant sur un sujet d'intérêt mathématique, mais ils se réservent le droit de les comprimer. Les lettres acceptées paraîtront dans la langue dans laquelle elles nous sont parvenues. Les lecteurs pourront nous joindre au bureau administratif de la SMC ou à l'adresse suivante: [notes-lettres@smc.math.ca](mailto:notes-lettres@smc.math.ca).

## Report on the Meeting of the CMS Board of Directors December 7, 2001

by Walter Craig (McMaster), Delegate from the AMS

*Reprinted from the American Mathematical Society Council Minutes of January 5, 2002*

From a busy week in the Toronto area, including the CMS Winter Meeting, satellite meetings at the University of Toronto, and Fields Institute workshops, I took an afternoon off to accept the invitation to participate in the CMS Board of Directors meeting on December 7, 2001. The first item of interest is immediately apparent, as unlike the AMS, the CMS has one body, the Board, which concerns itself both with scientific activities and the financial aspects of the Society. I learned that I was not to be a mere observer, that I was invited to take an active part in the Board's discussions, and indeed I was privy to very detailed information about the Society's budget, investment strategies and the level of profitability of their various activities. I was not accorded voting rights but I was interested to see that the Board members apparently had been doing their homework. It was a pleasant and collegial meeting, J. Borwein presided as President of the CMS and gracious host, and there was much unanimity within the group for the direction of CMS activities and for mathematics policy in general.

One of the items of discussion, the impending NSERC re-allocation exercise, is interesting in its own right, and merits a thought given the present US science funding structure. Every 4 years, all science disciplines represented within a budget line in the NSERC (Natural Sciences and Engineering Research Council) research funding undergo a reassessment of their funding level. A minimum of 90% of their budget is guaranteed for the next cycle (avoiding drastic funding changes), but 10% goes into a pool. Each discipline must produce a document justifying, from their projected research activities and their expected impact, further budget contributions from this pool. A discipline's budget can thus decrease by 10%, or increase dramatically, depending upon its research health and the vigor with which its members argue for budget increases. Needless to say, it is a matter of concern to avoid doing poorly in this exercise, which is itself purportedly a zero-sum activity which puts mathematics in direct competition with physics, chemistry, computer science and all or almost all engineering disciplines. It seems to me that there is a very strong and compelling argument for increasing mathematics funding in the present cycle based on the breadth of mathematical activities and their applications, the need to support university researchers who also have as an instructional component of their profession to teach courses to scientists across all disciplines, and as a response to the many emerging high-tech industrial developments which have mathematics as a basic component (tomography, cryptography, design of photonic devices, computer vision) as well as traditional applications of mathematical modeling.

A second item of discussion also touches on governmental science funding. At present, federal grants in Canada allow no indirect cost recovery by the sponsoring institution. Those of us who have worked at high-overhead institutions may think of this as quite nice, however the other side of the coin is that it disallows a major source of research infrastructure support for universities (and incidentally, a big motivation to universities to promote high-quality research). The CMS, along with the other scientific professional societies, has written Paul Martin, the Canadian Minister of Finance, and Brian Tobin, The Canadian Minister of Industry, requesting that the upcoming national budget contain provisions for indirect cost recovery for universities. What I presume we are hoping is that this will be added onto our present research funding allocations, rather than subtracted from them. Along the same lines, there is clear federal support for, and emphasis on, innovation, as witnessed by the Canada Research Chairs Program (chaired research professorships), the Canada Foundation for Innovation (university major research infrastructure funding) and the large variety of provincial sources of direct funding for research and research infrastructure.

Further items of discussion that are of interest to the AMS and its members include:

- (1) CMS sponsored National Fora on education, especially science teaching in public schools, and follow-up efforts to keep a connection to K-12 institutions and to publish the findings/points of discussion of the fora. Two are scheduled so far, in Montréal in 2003 and at the Fields Institute in Toronto in 2004, and the avenue is open to hold others.
- (2) The CMS seems quite interested in joining the list of societies in the Combined Membership List. They hope to be on the electronic list by 2002, and the printed one later, the difference being the expense and the current formatting of the membership lists.
- (3) Directors of three of the four national mathematics institutes gave invited reports of their activities. One of the points of discussion was the different and complementary roles of the institutes and the CMS, and the interest and willingness to find modes of cooperation, especially between the latter and the institutes.
- (4) The CMS website, and a variety of publishing issues of the CMS were discussed. As with the AMS, the publishing component of the CMS runs a net profit, which supports many other worthy but less profitable CMS activities. This is, of course, accepted to be as it should.
- (5) Flowers were sent to Donald Coxeter at his home, where he is still alert, but not well enough to be able to come down to the CMS meeting. Professor Coxeter sent his greetings to the Board and to the CMS meeting participants.



## DU BUREAU DU DIRECTEUR ADMINISTRATIF

### À la croisée des chemins

L'examen mené par nos groupes de travail enclenché en 1998 a connu son dénouement avec le dépôt du rapport final du Groupe de travail numéro 9 (administration et gouvernance) présenté au Conseil d'administration en juin 2001. Même si, à bien des égards, nous avons beaucoup avancé au cours des trois dernières années et avons apporté bien des changements, il reste un aspect important à l'étude par le Comité exécutif et le Conseil d'administration : le plan de publication pour les années 2003 et les suivantes.

Les rapports annuels des comités de 2001 montrent encore une fois la vaste gamme d'activités de recherche, de publication et d'éducation qui sont appuyées par la SMC, ainsi que par ses nombreux membres et autres bénévoles.

Toutes les activités de la Société sont coordonnées à partir du bureau administratif d'Ottawa. La SMC compte plusieurs employés à plein temps : Monique Bouchard, chef des opérations; Liliane Sousa, responsable de l'adhésion et des publications; Suzanne Lalonde, adjointe administrative; Caroline Baskerville, adjointe au directeur administratif; Alan Kelm, gestionnaire des services Web (à plein temps depuis le 1er juillet 2001). La SMC a éprouvé quelques difficultés à pourvoir au poste de chargé des comptes, mais j'ai bon espoir que l'on aura trouvé un bon candidat au début de 2002. Bon nombre de nos membres auront rencontré ces personnes à l'occasion de nos Réunions semestrielles. Au nom de la Société, je souhaite exprimer mes sincères remerciements à tous nos employés, à plein temps ou à temps partiel, pour leur soutien inestimable.

Nos services électroniques prennent de plus en plus d'ampleur et constituent des outils importants pour nos membres, abonnés et autres visiteurs. Même si la Société a déployé des ressources considérables pour offrir des services de bonne qualité, la somme de travail requise a augmenté considérablement, et il est devenu évident que la Société avait besoin d'un gestionnaire des services Web à plein temps. J'étais très heureux que le gestionnaire de Camel dans l'Est à temps partiel ait accepté ce poste. La première grande mise à jour du site Web de la SMC a donc eu lieu en 2001, et le nouveau site a été inauguré en décembre. La mise à jour avait pour but de mieux regrouper les divers éléments du site, de procurer aux visiteurs des instruments de navigation plus simples et dans les deux langues officielles, d'offrir un plan général du site et des plans de sections, etc. En 2002, d'autres travaux sont prévus; il faut notamment refaire le design de certaines pages, améliorer le système de comptes et de mots de passe et les fonctions d'accès, et terminer la migration du serveur de Camel ouest à Vancouver au serveur Web qui se trouve à Ottawa.

Grâce à l'appui du CRM et des instituts Fields et PIMS, par l'entremise du Comité du programme national, ainsi qu'au soutien des départements hôtes et de nos autres commandi-

naires et à l'aide considérable des directeurs de Réunion, des organisateurs de séances et des comités d'organisation locaux, les deux Réunions de la SMC de 2001 ont été de grandes réussites du point de vue scientifique. La Réunion d'été de 2001, tenue à Saskatoon, a aussi été une réussite financière, mais la Réunion d'hiver 2001, qui a eu lieu à Toronto, a entraîné un déficit beaucoup plus élevé que prévu. Dans ce dernier cas, les dépenses ont été très près des prévisions, mais les revenus en droits d'inscriptions ont été de beaucoup inférieurs à ce que l'on avait prévu. Il est possible que les participants aient été moins nombreux en raison des événements du 11 septembre, mais une chose est sûre, il faut attirer plus de participants pour assurer la réussite de nos rencontres, tant au plan scientifique que financier. Des séances diversifiées contribuent pour beaucoup à attirer des participants. Le programme de la Réunion d'été 2002 de la SMC, qui se tiendra à Québec, offre justement un grand nombre de séances, ce qui devrait en faire un événement réussi à tous points de vue.

La Société offre tout un éventail d'activités d'enrichissement mathématique. Au nombre de ces activités, mentionnons : la brillante participation canadienne à l'Olympiade internationale de mathématiques 2001; l'Olympiade mathématique du Canada 2001; le Défi ouvert canadien de mathématiques 2001; la revue de résolution de problèmes de la SMC (CRUX with MAYHEM), les séances sur l'éducation aux Réunions semestrielles de la SMC, les conférences publiques et les camps régionaux et nationaux de mathématiques. Ces activités ne sont possibles qu'en raison du soutien indispensable des gouvernements provinciaux, de sociétés privées, de fondations et des membres de la SMC. Le programme de camps de mathématiques Esso/SMC a connu un vif succès et continue de prendre de l'ampleur. En 2002, après quatre années seulement, il y aura au moins un camp dans presque toutes les provinces.

Nos publications sont toujours d'un niveau très élevé et paraissent toujours aux dates prévues. La collection de livres de la SMC, chez Springer-Verlag, progresse rapidement; à ce jour, 9 ouvrages ont été publiés. Les démarches continuent pour trouver des travaux à publier dans les Traités de mathématiques de la SMC (publiés en collaboration avec l'American Mathematical Society) et la collection «Aime-t-on les mathématiques» (ATOM), une collection de livrets à l'intention des élèves du secondaire. Le contrat de publication avec l'Advanced Publishing Research Lab (APuRL - SFU) n'a pas donné les résultats prévus. Le contrat prévoyait quatre modules, mais en raison de circonstances imprévues, seuls les deux premiers (Authentications and Permissions et System Integration) seront livrés sous une forme ou une autre. Le coût de ces deux modules correspond aux conditions du contrat entre la SMC et l'APuRL, et la Société prend des

mesures pour produire les deux autres modules (Manuscript Management et System Management Integration) soit par ses propres moyens, soit avec un autre partenaire.

Les activités de recherche, éducatives et administratives de la Société ne sont rendues possibles qu'en raison des revenus considérables que nous tirons de nos diverses publications. Au cours des quelques dernières années, nous avons accumulé un surplus dans notre budget de fonctionnement et, conformément à notre politique, nous avons transféré la partie du surplus accumulé qui dépassait 75 000 \$ au fonds de dotation. Même si un surplus à ce budget était prévu pour 2001, il semble maintenant que nous connaîtrons un déficit considérable. On prévoit aussi un déficit pour l'année 2002. La Société est à une croisée des chemins ... si nous ne parvenons pas enrayer le déficit, la Société aura beaucoup de mal à poursuivre ses activités au rythme actuel.

En 2002, nos principaux objectifs consisteront à accroître les revenus provenant des adhésions et des dons, et à élaborer un plan de publication qui nous permettra d'augmenter, à long terme, nos revenus de la vente de publications. Un élément important de notre plan, accepté par le Conseil d'administration en décembre 2001, est l'expansion de notre Bureau de publication situé à Winnipeg. Certains postes

actuels seront fusionnés, d'autres, éliminés. Un nouveau poste a été créé, celui d'éditeur de la SMC. Pour ce poste, qui devrait être annoncé au début de 2002, on cherchera probablement un candidat de niveau universitaire. La personne retenue sera responsable de la promotion de toutes nos publications et de l'obtention de contrats pour le Bureau de publication. À part les titres des postes qui diffèrent, notre plan ressemble beaucoup (à une échelle très réduite) à celui adopté par l'American Mathematical Society.

En juin 2002, j'aurai terminé ma vingt-troisième année au poste de directeur administratif et de secrétaire de la Société mathématique du Canada. La communauté mathématique canadienne a beaucoup changé au cours de cette période. Ma décision d'accepter de continuer pendant deux autres années a été grandement influencée par le soutien incroyable que j'ai reçu des présidents, vice-présidents, trésoriers, directeurs, présidents de comités, membres et rédacteurs avec lesquels j'ai eu le plaisir de travailler. Tout comme l'appui considérable du personnel du bureau administratif d'Ottawa et des autres bureaux ailleurs au pays.

Je serai très heureux d'aider la Société à surmonter les obstacles qui se présentent et à profiter des belles occasions qui s'offrent à elle.

*(FERMAT—continued from page 4)*

considered as one chamber divided in two. In the two chambers des enquêtes civil actions were decided in writing in the final instance.

The chairman of the Grand' Chambre and head of the whole parliament was the premier président. He was the only magistrate who had not purchased his office, being appointed by the king. His deputies in the Grand' Chambre and the chairmen of the other chambers, were présidents à mortier (two or three per chamber) who had also bought their prestigious offices, at three times the price of the ordinary conseillers. They regularly led the sittings of their chambers in rotation.

An ordinary conseiller, as Fermat remained all his life, could also play a central role if he was appointed the rapporteur of a case by the chamber. Additional income came with a rapporteur's role in a court case, and a hardworking rapporteur could raise his income significantly. Fermat was one of the most hardworking rapporteurs of the parliament; for example, in a ten-week period in the Tournelle from November 1657 to January 1658, he wrote no fewer than 34 rapports/arrêts. Fermat drew up his first arrêt on 6 December 1632 in the chambre des requêtes, his first rapport in the Grand' Chambre on 9 December 1654, and his last arrêt in the chambre de l'Edit on 9 January 1665, three days before his death.

The four chambers mentioned above formed the proper cour of the parlement de Toulouse. The chambre des re-

quêtes in which Fermat took up his office of conseiller and commissaire in 1631, did not belong to the proper cour of the parlement and was at the lower end of the parliament's hierarchy. Its members heard preliminary civil cases, leaving the final judgements to one of the chambres des enquêtes.

A commissariat aux requêtes was generally a position for a beginner, allowing him to become acquainted with the practice of the parliament, but it gave no advancement. For this purpose, the conseiller had to sell his office in the chambre des requêtes and purchase an office in the proper cour of the parliament. Fermat duly gave up his commissariat des requêtes on 4 December 1637, and acquired an office in the cour of the deceased Pierre de Raynaldy. He was registered at the court of the parlement on 16 January 1638, and held this office until his death.

During Fermat's time as a commissaire aux requêtes he made the acquaintance of his longtime friend Pierre de Carcavi, who in 1632 became his colleague at the parlement de Toulouse. Carcavi moved to Paris in 1636 and mediated for Fermat with Marin Mersenne and his Parisian circle. Fermat's longstanding correspondence with these gentlemen started a few days after Carcavi's arrival at Paris and lasted (with an interruption) until shortly before his death. Fermat's famous dispute with Descartes occurred at the time of his move from the chambre des requêtes to the first chambre des enquêtes.

The chambre de l'Edit de Nantes belonged to the par-

lement de Toulouse. This chamber was created in 1598 by Henri IV, with equal representation by members of the Reformed Church and the Roman Catholic Church, and had its seat from 1632 to 1670 in Castres, 75 kilometres to the east of Toulouse. In this chamber, all cases of conflict, and all criminal cases in which adherents of both religions were involved, were settled. It consisted of two presidents, one from each Church, as well as ten magistrates of each denomination. The judges, members of the Reformed Church, were local and had purchased their offices. Each year, eight of the Catholic judges were elected by the king from a list of twelve *conseillers au parlement de Toulouse* that had been compiled by the *Grand' Chambre*. On 29 May 1638, the *Grand' Chambre* nominated Fermat for the first time for the *chambre de l'Edit*, and Fermat was selected by the king on 16 July. He spent the session of 1638-9 with his family in Castres.

From 1646, Fermat's letters to his erudite colleagues became sparse, and for several years his mathematical correspondence almost stopped completely. Why was this? Deteriorating mental ability? (Fermat was just forty years old.) Mersenne's death on 1 September 1648? (His place was soon taken over by Carcavi.) We have rather to look for reasons among the strains of Fermat's professional life; these were connected with social and political disturbances: peasants' revolts in the south of France arising from brutal methods of tax collections, the rebellion of the Fronde against Mazarin, and the war against Spain. At the beginning of the 1650s, the last great French plague epidemic broke out, followed by famine.

We are rightly used to seeing Fermat as the great mathematician and humanist scholar. But according to his conception of himself, he was first and foremost a judge. At the parliament of Toulouse he had a seat for life. Even though he could live off his possessions in Beaumont-de-Lomagne, he regarded his job as *conseiller au parlement de Toulouse* as his proper life's work, and his career in this institution was more important to him than his reputation as a mathematician. Only when his professional activities allowed him enough leisure, such as when parliament was not in session during the numerous religious festivals, could he devote himself to his hobby of mathematics.

Fermat spent the great parliamentary recesses in September and October à la campagne in Beaumont-de-Lomagne, where at harvest time he received his share of the yields from the leased farms, as agreed by contract. He gave advice on legal questions to the inhabitants of his home town, and regularly took part in the citizens' meetings – his name turns up in the minutes for many years – helping them with particularly difficult items on the agenda. The Fermat family also showed its close attachment to Beaumont with charity and donations and by becoming godparents on numerous occasions. Very often Fermat had less time there for his beloved 'geometry' than he had hoped.



The Huguenot stronghold Castres, seat of the *chambre de l'Edit de Nantes*, was a particularly strong attraction for Fermat. Again and again he tried, not always successfully, to be proposed by the *Grand' Chambre* for the delegation to Castres and to be confirmed by the king. Between 1632 and 1665, of the 45 *conseillers au parlement de Toulouse* delegated to Castres whose term was renewed by the king for a further year, seven were renewed twice, four three times, and only Fermat four times: in 1644-6, 1648-50, 1655-7 and 1663-5. But what attracted Fermat so strongly to this town on the banks of the river Agout?

Three reasons can be given. First, a certain sympathy for the Reformed Church, which can already be observed in his parents and grandparents. Secondly, Fermat's exceptional capability as a mediator between conflicting interests, inherited from his father Dominique, which could not show to better advantage than at a chamber where reconciliation between the representatives of the two religions had regularly to be sought. The third, and perhaps strongest, reason was the intellectual atmosphere of Castres which, while the seat of the *chambre de l'Edit*, saw a golden age of culture that it never achieved again, before or since. Historians of Toulouse lament the intellectual fall of that town in almost all areas of art and science at that time, particularly with regard to the university, but note as an exception and *gloire de Toulouse* the great scholar Pierre de Fermat.

In Castres, in 1648, the Protestant Academy was founded with 20 initial members who came exclusively from the Reformed Church. Most of these gentlemen were *conseillers* or *avocats* of the *chambre de l'Edit*. Among them were the poets Samuel Izarn, Hercule de Lacger and Jacques de Ranchin, the

theologians Raymond Gaches and André Martel, the philosopher Pierre Bayle, the medic, chemist and philosopher Pierre Borel, the physicist and translator Pierre Saporta, and the historiographer Paul Pellisson, but no mathematician.

Bayle and Pellisson enjoyed national reputation, and Saporta and de Ranchin were Fermat's friends. The latter read poems of Pierre and Samuel Fermat at meetings of the Academy; to him Fermat dedicated his critical commentary on the work of the Greek historian Polyainos, thereby demonstrating a knowledge of Greek philology. In 1664 Fermat saw one of his (own)rare works printed, prepared by Saporta; it concerns a short text in which Fermat interprets a passage from a letter of Synesios of Kyrene. Time and time again, Fermat felt drawn to Castres; his youngest daughter Louise was born there in 1645, and when Fermat died there in 1665 his younger son Jean was canon in Castres.

His strong interest in a delegation to Castres did not prevent Fermat from pressing ahead with his professional rise to the Grand' Chambre. By 1647 he was already the longest serving conseiller in the first chambre des enquêtes and he frequently took over the presidency when the présidents à mortier were both absent.

His move from the first chambre des enquêtes to the Tournelle coincided with the outbreak of the Toulouse plague epidemic of August 1652 to July 1653. About 4,000 citizens died - about ten per cent of the town's population - and Fermat himself almost fell victim to the plague. In May 1653 the philosopher Bernard Medon, conseiller au présidial de Toulouse and a friend of Fermat, wrote to the Dutch writer Nicolaas Heinsius the Elder of Fermat's death (*Fato functus est maximus Fermatius*), only to withdraw this news in his next letter: *Priori monueram te de morte Fermatii, vivit adhuc, nec desperatur de ejus salute, quamvis paulo ante conclamata*. Fermat was one of those who became ill with the bubonic plague and survived, but his health was weakened from this time onwards.

Soon after the outbreak of the plague Fermat progressed to the Tournelle, according to the principle of seniority, and from there a move to the Grand' Chambre was routine. In November 1654 he became a member of the highest chamber of the parliament, and on 9 December he read his first rapport there. In November 1655 he was back in Castres, but returned to Toulouse in November 1657, again to the Tournelle.

Throughout his life, Fermat was a loyal servant of the Crown. Born during the regency of Henry IV, he was a fourteen-year-old boy when the young king Louis XIII spent the night of 24 November 1621 in his father Dominique's house in Beaumont-de-Lomagne, while on a journey from Toulouse to Lectoure. But Fermat's impression of his king did not remain unsullied. In 1632 he witnessed the arrival in Toulouse of Louis XIII, with Cardinal Richelieu and 5000 soldiers. The king forced the Toulouse Grand' Chambre and the Tournelle to condemn to death the popular and highly re-

garded Duke Henri II de Montmorency because of rebellion against the king. The awkward task of rapporteur in this case fell to the oldest conseiller of the Tournelle, Fermat's father-in-law Clément de Long, in whose house Fermat lived at that time with his wife Louyse.

A stereotype that goes back to Mahoney (see [7]), and has been adopted by more recent authors, is that Fermat was a mediocre conseiller and judge who tried to avoid all social, political and religious conflicts. Nothing is further from the truth. Fermat was no jurist who composed legal treatises, but was an outstanding practitioner who, tolerant of religious differences, stood up for justice and humanity without shrinking from confrontations with the mighty, such as the first president Gaspard de Fieubet.

In 1648 and 1651 Fermat committed himself to a rather hopeless fight against the illegal and brutal methods with which the tax collectors (partisans) recovered the taille from the farmers. On this occasion Fermat uncovered the partisans' deceitful practice of backdating the tax receipts, thereby withholding for themselves revenues that were due to the king. In 1651, at the time of the Fronde, he was a member of the delegation for the parliament of Toulouse which successfully demanded (after negotiation for several months) that the delegates of the Estates of Languedoc (who took the side of the Fronde) should return to a legal state of affairs loyal to the king. And on 30 July 1652, through a courageous visit to the camp of the royal army, he prevented his home town of Beaumont-de-Lomagne (which had been plundered by the soldiers of the Fronde) from being taken by storm and completely destroyed by the king's soldiers. After the defeat of the Fronde, Fermat achieved through tough negotiation the outcome that Beaumont should receive reparation payments of 16266 livres. In 1654 Fermat put through the Grand' Chambre a fairer distribution of the income from the charges between the Tournelle and the Grand' Chambre; in this way, Fermat made himself unpopular with the clerics in the Grand' Chambre.

Another stereotype is the claim that Fermat never ventured farther than Bordeaux (see [13, p.39]). As we have already seen, he studied law in Orléans from 1623 to 1626. He may also have visited Paris as a student. Certainly, his duties as a conseiller forced him to undertake longer journeys; for example, in November 1646 the Grand' Chambre banned the dyers of Nîmes from buying highquality indigo from the Middle East instead of the woad produced around Toulouse. When the dyers disobeyed the ban, Fermat was sent to Nîmes, about 300 kilometers to the east of Toulouse, to present the parliament's decision and confiscate the forbidden dyestuff. This wasn't a pleasant task for a 'gentle, retiring, even shy man' ([7, first ed., p.22]). Frequently Fermat was assigned to a small group of conseillers who travelled far to meet bishops, ministers and other dignitaries, or escorted them a long distance when they had taken their leave of Toulouse. In such cases

Fermat's reputation as a scholar and good conversationalist was the reason for his selection.

Certainly Fermat was political, but he lacked two important qualities: unscrupulousness and ambition for power. But his abilities as a jurist have also been doubted by Mahoney (see [7, second ed., p.20]) who wrote: 'The most candid appraisal of Fermat's abilities as a jurist, and one that runs counter to the usual adulation, comes from a secret report of Claude Bezins de Bessons, intendant of Languedoc, to Minister Colbert in 1663. Speaking of the conseillers and their relations to the suspect First President, Gaspar de Fieubet, Bezin said of Fermat: "Fermat, a man of great erudition, has contact with men of learning everywhere. But he is rather preoccupied; he does not report cases well and is confused. He is not among the friends of the First President".' Mahoney then drew negative conclusions with regard to Fermat's judicial qualities that have since been adopted without question by other authors. If he had investigated more carefully, such incorrect judgements would not have occurred to him.

In 1965, the legal historian Henri Gilles of Toulouse showed, in a careful investigation which Mahoney obviously did not read, that Fermat always cultivated a very clear style and that the language of his arrêts and reports stands comparison with the style of those written by his colleagues (see [6]). I have convinced myself that Gilles is right. A disparaging judgement by the intendant Claude Bazins de Bessons is easily explained: in September 1663 the minister Jean-Baptiste Colbert demanded from the intendants individual judgements of all conseillers and other royal officials at the parliaments. The intendants complied with this request so reluctantly that Colbert asked some intendants for greater thoroughness. Had Mahoney read the whole report of 24 December 1663, and not only an isolated citation in the accompanying text for an exhibition catalogue (see [3, p.33]), he would have realised how superficial the judgements turned out to be (see [5, p.11 ff]).

De Bessons resided in Montpellier and had to travel to Toulouse to make investigations and write his report. There he first informed himself about the conseillers. By that time Fermat was not in Toulouse, but rather in Beaumont or Castres. Therefore de Bessons turned to the king's man, the first president Fieubet, Fermat's enemy. That no fair judgement resulted is not surprising.

Much more interesting is the reason for the aversion between Fermat and Fieubet. The judicial murder of a priest, Jean Montralou, was stagemanaged by Fieubet on 26 January 1658 (see [1]). This case had a Jansenist background, and Fermat was involved in it as rapporteur and examining judge. Montralou, of whose proved innocence Fermat was convinced, was hanged next day and his body was burned. Fermat was so incensed and shocked that he could not work as a judge for a month. On 6 February 1658, Sir Kenelm Digby, a notorious liar, reported on this case to John Wallis in Oxford, but in form of a wicked slander: that it was Fermat

who condemned the priest to be burned alive (see [12, p.808f] and [8, p.360]).



Perhaps because of this event, or because of his visibly deteriorating health, Fermat seems to have thought about relinquishing his office of Conseiller in the Grand' Chambre. In a letter of 25 July 1660 to the ailing Pascal, he proposed that the two men should meet halfway between Clermont-Ferrand and Toulouse because his health was hardly better than Pascal's [10, Vol. II, p.450]). If the latter expected Fermat to travel the whole distance of 300 kilometres, then Pascal would run the risk de 'me voir chez vous et d'y avoir deux malades en même temps.'

On 4 March 1660, Fermat wrote his last will and testament, with his elder son Samuel as his sole heir. He amplified this testament on 13 September 1664, in a codicil in which he made settlements in favour of his wife Louyse: Samuel was to pay his mother 32000 livres from the inheritance, an imposing sum which she could make good use of. Louyse outlived her husband by more than 25 years. In the preamble of this codicil Fermat speaks rather openly of his coming end ([4, p.347]): 'Je sousigné éstam incommodé d'une maladie qui pourroit avoir de mauvaises suites.' In October 1664 Fermat set off for Castres for the last time, and died there on 12 January 1665 aged 57 years, after receiving the holy sacraments and with an alertness of mind to the end. On the next day he was laid to rest in the chapel of the Jacobins in Castres.

The date of Fermat's birth is disputed, and there is also confusion about where his mortal remains found their last resting place. Is it the chapel of the Jacobins in Castres which was demolished soon after Fermat's decease? Or is it the family mausoleum in the church of the Augustins in Toulouse, to which Samuel and Jean Fermat had their father's body moved? After examining all arguments (see [11, 4]) I believe that Fermat's body was transferred to Toulouse in the year of his death. But there is no proof. The family mausoleum was destroyed during the French Revolution and only Fermat's epitaph, has survived.

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## UPCOMING CONFERENCES

### The 11th International Workshop on Matrices and Statistics

Lyngby, Denmark: August 29-31, 2002

The Eleventh International Workshop on Matrices and Statistics, in Celebration of George P. H. Styan's 65th Birthday, will be held at the Technical University of Denmark (DTU) in Lyngby, near Copenhagen, on August 29-31, 2002. This Workshop will be hosted by the Division of Image Analysis and Computer Graphics in the Department of Informatics and Mathematical Modelling (IMM) at the Technical University of Denmark and has been endorsed by the International Linear Algebra Society (ILAS).

#### Organizing Committees Workshop Secretary

International Organizing Committee (IOC):

R. W. Farebrother (Victoria Univ. of Manchester, UK),

S. Puntanen (Univ. of Tampere, Finland),

H. J. Werner: werner@united.econ.uni-bonn.de (Univ. of Bonn, Germany; chair).

Local Organizing Committee (LOC):

K. Conradsen: kc@imm.dtu.dk (DTU, Kgs. Lyngby, Denmark; chair),

B. K. Ersboll (DTU, Kgs. Lyngby, Denmark),

P. C. Hansen (DTU, Kgs. Lyngby, Denmark),

A. A. Nielsen (DTU, Kgs. Lyngby, Denmark).

Workshop Secretary (WS):

Ms. Helle R. Welling: matrix02@imm.dtu.dk (DTU, Kgs Lyngby, Denmark).

The purpose of this Workshop is to stimulate research and, in an informal setting, to foster the interaction of researchers in the interface between matrix theory and statistics. This

Workshop will provide a forum through which statisticians working in the field of linear algebra and matrix theory may be better informed of the latest developments and newest techniques and may exchange ideas with researchers from a wide variety of countries. This Workshop will include the presentation of both invited and contributed papers on matrices and statistics; it is expected that many of these papers will be published, after refereeing, in a Special Issue on Linear Algebra and Statistics of *Linear Algebra and Its Applications*. Contributed Papers are welcome!

More details on this Workshop (Workshop Fees and Payment, Registration Form, Paper Submission, Deadlines, Accommodation, etc) will be updated regularly on our Workshop Web site:

<http://www.imm.dtu.dk/matrix02/>

You might like to add this address to your Personal Bookmarks file. There you will also find an Early Tentative Registration Form.

### Fourth Geoffrey J. Butler Memorial Conference

University of Alberta, June 17 – 21, 2003

**Theme:** A gathering for researchers in Differential Equations and Mathematical Biology. This conference is in honor of the memory of our former colleague Geof Butler. It will also celebrate the career and retirement of Paul Waltman of Emory University.

**G.J. Butler Speaker:** Gail Wolkowicz, McMaster University, wolkowic@mcmaster.ca (confirmed)

**Invited One hour Speakers (to be confirmed):**

Odo Diekmann, Universiteit Utrecht, diekmann@math.uu.nl  
 Karl-Peter Hadeler, Universtaet Tuebingen, k.p.hadeler@uni-tuebingen.de (confirmed)

Yang Kuang, Arizona State University, kuang@asu.edu (confirmed)

Konstantin Mischaikow, Georgia Institute of Technology, mischaik@math.gatech.edu

Wei Ming Ni, University of Minnesota, ni@math.umn.edu (confirmed)

Louis Nirenberg, New York University, nirenberg@cims.nyu.edu

Horst Thieme, Arizona State University, h.thieme@asu.edu (confirmed)

Jianhong Wu, York University, wujh@mathstat.yorku.ca (confirmed)

**Invited One Hour Local Speakers** (talks accessible to students):

Gerda de Vries, University of Alberta, devries@math.ualberta.ca (confirmed)

Michael Li, University of Alberta, mli@math.ualberta.ca (confirmed)

Thomas Hillen, University of Alberta, thillen@math.ualberta.ca (confirmed)

**Other Talks:** 20 - 30 minutes each (to minimize the number of parallel sessions). List of confirmed speakers . List of confirmed attendees .

**Contact:** Herb Freedman (herbfr@ualberta.ca) or Joseph So (joseph.so@ualberta.ca)

**Organizing and Scientific Committee:**

Walter Allegretto, University of Alberta, retl@retl.math.ualberta.ca  
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 Hal Smith, Arizona State University, halsmith@asu.edu  
 Joseph So, University of Alberta, joseph.so@ualberta.ca

If you are interested in attending or give a talk, please let us know at your earliest convenience. This will help us apply for funding.

**Registration Fee (tentative):** Cdn \$300 (early bird special \$250) for regulars and Cdn \$200 (early bird special \$150) for students. It includes the banquet.

**Sponsors:** G.J. Butler's Memorial Fund, Applied Mathematics Institute, University of Alberta.

**Abel Bicentennial Conference 2002**

University of Oslo, 3-8 June 2002

The year 2002 marks the bicentennial of the birth of Niels Henrik Abel, 1802-1829. The Conference will present an overview of the mathematical heritage of Niels Henrik Abel and, based upon this heritage, identify new mathematical trends for the 21st century.

The Abel Bicentennial Conference 2002 will include sections on:

History of Mathematics  
 Algebraic Geometry  
 Complex Analysis  
 Differential Equations  
 Non-commutative Geometry

Scientific committee: Michael Artin, Gerd Faltings,  
 Phillip A. Griffiths, Gennadi Henkin, Christian Houzel, Olav Arnfinn Laudal, Jacob Palis

Information: For information and registration see the web site: <http://www.math.uio.no/abel/conference/index.html>

**NOTICE**

The Exective Office will be closed for two weeks this summer from **August 5th to the 16th inclusive.**

**AVIS**

Le Bureau d'administration sera fermé pour deux semaines cette été du **5 au 16 août.**

*(EXEC—continued from page 1)*

and the new site was launched in December. The web site re-vamp included a better grouping of the various components, much easier and more bilingual navigation tools, overall and section site maps, etc. In 2002, further work is planned including a re-design of certain pages, an improved accounts system and password and access features, and the completion of the migration from the Camel west server in Vancouver to the web server in Ottawa.

Thanks to the support received from the CRM, the Fields Institute, and PIMS, through the National Program Committee, as well as support from the host departments and other sponsors, and the considerable assistance from the meeting directors, session organizers and local arrangement committee members, both of the Society's 2001 meeting were very successful scientifically. The 2001 Summer Meeting in Saskatoon was also successful financially but, unfortunately, the 2001 Winter Meeting in Toronto had a much greater deficit than anticipated. For the Winter Meeting, although expenses were very close to projections, the income from registration fees was well below expectations. It is possible that attendance may have been influenced by September 11th, nevertheless, it demonstrates that for our meetings to be successful, both scientifically and financially, they must attract more delegates. A wide range of sessions is an important component in attracting more delegates. The program for the CMS 2002 Summer Meeting in Quebec City has a large number of sessions and I believe the meeting will be very successful scientifically and financially.

Through the highly successful 2001 Canadian International Mathematical Olympiad team, the 2001 Canadian Mathematical Olympiad, the 2001 Canadian Open Mathematics Challenge, the CMS problem solving journal (CRUX with MAYHEM), education sessions at each semi-annual meetings, public lectures, regional and national Math Camps, and various other activities, the Society provides a wide array of educational enrichment activities. These activities are only possible because of the significant support received from provincial governments, corporations, foundations and CMS members. The Esso/CMS Math Camps Program has been extremely successful and continues to expand. In 2002, after only four years, there will be at least one camp in almost every province.

Our publishing activities continue their very high standards and appear in a very timely manner. The CMS Book Series with Springer-Verlag is progressing very well and 9 books in the Series have appeared so far. Work continues to attract works for the CMS Tracts in Mathematics (published in cooperation with the American Mathematical Society) and to attract manuscripts for "A Taste of Mathematics" (ATOM),

a series of work booklets for high school students continues. The Publishing Vortal contract with the Advanced Publishing Research Lab (APuRL - SFU) has not developed as planned. The contract included developing four modules but, in view of unforeseen circumstances, only the first two (Authentications and Permissions, and System Integration) will be delivered in some form. The cost for these two modules is in accordance with the contract between the CMS and APuRL, and the Society is taking steps to produce the other two modules (Manuscript Management and System Management Integration) either in house or with another partner.

The Society's research, educational and administrative activities are only possible because of the significant revenues obtained from our publication activities. For the past several years, a surplus in the Operations Fund has been achieved and, as policy dictates, the cumulative surplus above \$75,000 transferred to the Endowment Fund. Although a surplus in the Operations Fund was projected for 2001, it now appears there will be a significant deficit. A deficit is also projected for 2002. The Society is at a cross-roads, and, if the deficit situation cannot be addressed, the Society's ability to continue its current programs will be drastically affected.

The focus in 2002 will be to increase membership and donations revenues and create a Publications Plan that will yield additional publications revenues in the long-term. A major component of the Publishing Plan, that was accepted by the Board of Directors in December 2001, is an expanded Publications Office in Winnipeg. Some existing publications positions will be amalgamated and some eliminated. A new position of CMS Publisher has been created. The position will probably be an academic one and will be advertised early in 2002. This person would be responsible for promoting all of our publications and also for obtaining contract work for the Publications Office. Although the titles of the positions are not the same, it is worth noting that the Publications Plan being proposed, is very similar to that adopted by the American Mathematical Society.

In June 2002, I will have completed twenty three years as Executive Director and Secretary of the Canadian Mathematical Society. The Canadian mathematical community has changed considerably during this period. In deciding to accept to continue for a further two years, the tremendous support I have received from the presidents, vice-presidents, and the treasurer, as well as the many directors, committee chairs, members and editors who I have had the pleasure to work with, contributed greatly to this decision, as did the considerable help from the staff at the Executive Office in Ottawa and the other offices throughout Canada.

I look forward to helping the Society face the challenges and opportunities that are ahead.



## CALENDAR OF EVENTS / CALENDRIER DES ÉVÉNEMENTS

### APRIL 2002

**5–6** The 28th Annual New York State Regional Graduate Mathematics Conference (Syracuse University, Syracuse, New York)

<http://math.syr.edu/mgo/conference/conf.html>

**8–19** Invariant Theory (Queen's University, Kingston, ON)

[activites@crm.umontreal.ca](mailto:activites@crm.umontreal.ca),

<http://www.CRM.UMontreal.CA/geometry/>

**30–May 17** Concentration Period on the Langlands Programme for Function Fields (CRM, Université de Montréal, Montréal)

[activites@crm.umontreal.ca](mailto:activites@crm.umontreal.ca),

<http://www.CRM.UMontreal.CA/geometry/>

### MAY 2002

**3–4** Workshop on Topology in Computer Science (City College, City University of New York, N.Y.)

<http://topann.home.att.net>

**3–5** AMS Eastern Section Meeting (CRM, Université de Montréal)

<http://www.ams.math.org/meetings/>

**17–31** 6th PIMS Industrial Problem Solving Workshop (UBC, Vancouver, BC)

[frigaard@math.ubc.ca](mailto:frigaard@math.ubc.ca)

**19–25** Canadian Number Theory Association Conference (CRM, Université de Montréal, Montréal)

<http://www.math.mcgill.ca/cnta7>

**24–26** Annual Meeting, Canadian Society for History and Philosophy of Mathematics / Société canadienne d'histoire et de philosophie des mathématiques (University of Toronto)

<http://www.cshpm.org>

**24–28** 25th Anniversary Meeting of the Canadian Mathematics Education Study Group (CMESG), (Queen's University, Kingston, ON)

[david.reid@acadiau.ca](mailto:david.reid@acadiau.ca)

**27–June 10** Computational Lie Theory (CRM, Université de Montréal, Montréal)

[activites@crm.umontreal.ca](mailto:activites@crm.umontreal.ca),

<http://www.CRM.UMontreal.CA/geometry/>

### JUNE 2002

**3–8** Abel Bicentennial Conference 2002 (University of Oslo, Oslo, Norway)

<http://www.math.uio.no/abel/conference/index.html>

### AVRIL 2002

**3–9** BIOCAMP 2002: Topics in Biomathematics and related computational problems at the beginning of the third millennium (Vietri sul Mare (Amalfi coast), Italy)

<http://www.dma.unina.it/biocomp/>

**4–13** Linear Algebra Workshop (Bled, Slovenia)

[luzius@mathstat.dal.ca](mailto:luzius@mathstat.dal.ca), <http://www.ijp.si/ftp/pub/stop/law/>

**6–8** CAIMS 2002 (University of Calgary)

Samuel Shen: [shen@maildrop.srv.ualberta.ca](mailto:shen@maildrop.srv.ualberta.ca)

**6–8** Conference on zero-dimensional schemes and related topics, in honor of Tony Geramita's 60th birthday (Acireale, Italy (Sicily))

<http://cocoa.dima.unige.it/conference/acireale/first.html>

**10–15** Algebraic Transformation Groups (CRM, Université de Montréal, Montréal)

[activites@crm.umontreal.ca](mailto:activites@crm.umontreal.ca),

<http://www.CRM.UMontreal.CA/geometry/>

**15–17** CMS Summer Meeting / Réunion d'été de la SMC (Université Laval, Québec, Québec)

<http://www.cms.math.ca/Events/summer02/>

**17–21** Seventh International Conference on p-adic Functional Analysis, (University of Nijmegen, The Netherlands)

<http://www.sci.kun.nl/math/p-adic2002/>

**17–21** Householder Symposium on Numerical Linear Algebra (Peebles Hydro Hotel, near Edinburgh, Scotland)

[p.a.knight@strath.ac.uk](mailto:p.a.knight@strath.ac.uk)

<http://www.maths.strath.ac.uk/matrix/>

**24–28** Special Activity in Analytic Number Theory (Max Planck Institute, Bonn) [moroz@mpim-bonn.mpg.de](mailto:moroz@mpim-bonn.mpg.de)

**25–28**, 8th International Conference on Applications of Computer Algebra (Volos, Greece)

<http://www.uth.gr>, <http://www.volos-m.gr>

### JULY 2002

**1–5** Congrès à la mémoire de Jacques-Louis Lions (Collège de France, Paris)

<http://acm.emath.fr/congres-jllions/>

**7–12** The 5th Americas Conference in Differential Equations and Nonlinear Dynamics (University of Alberta, Edmonton)

<http://www.math.ualberta.ca/mli/americas.htm>

email: [mli@math.ualberta.ca](mailto:mli@math.ualberta.ca)

**8–19** SMS-NATO ASI: Normal Forms, Bifurcations, and Finiteness Problems in Differential Equations (Université de Montréal, Montréal)

<http://www.dms.umontreal.ca/sms>

### JUIN 2002

### JUILLET 2002

**15– Aug 10** Conference on Representation Theory of Algebras and Related Topics (ICRA X) (The Fields Institute for Research in Mathematical Sciences, Toronto)  
*icrax@fields.utoronto.ca*

**22–30** 44th International Mathematical Olympiad (University of Strathclyde, Glasgow, UK)

**22–Aug 16** Atlantic Association for Research in the Mathematical Sciences Summer School (Memorial University of Newfoundland, St. John's)  
*http://www.math.mun.ca/aarms/SS2002* or email Edgar Goodaire (*edgar@math.mun.ca*)

**28– Aug 17** Summer Graduate Workshop in Matrix Theory (University of Regina, Regina, SK)  
*gradapps@math.uregina.ca, http://www.math.uregina.ca/workshop/*

**31–Aug 3** Novel Kananaskis Symposia on Pressure Distribution  
*www.wcb2002.com, info@wcb2002.com*

**AUGUST 2002****AOÛT 2002**

**2–3** Banff Symposia on Skeletal Muscle  
*www.wcb2002.com, info@wcb2002.com*

**3–10** Logic Colloquium 2002, ASL European Summer Meeting (WestfWilhelms-Universität, München, Germany)  
*http://www.math.uni-muester.de/LC2002*

**4–9** World Congress of Biomechanics  
*www.wcb2002.com, info@wcb2002.com*

**7–12** Marsden Workshop on Geometry, Mechanics and Dynamics (The Fields Institute for Research in Mathematical Sciences, Toronto)  
*marsden60@fields.utoronto.ca*

**14–18** Satellite Conference(of ICM 2002) on Operator Algebras and Applications (Hebei University of Technology, Chengde, Hebei, China)  
*http://www.oainchina.org*

**15–18** The International Conference on Mathematical Biology (a satellite meeting of ICM-2002)(Guangxi Normal University, Guilin, Guangxi Province, PR China)  
*gxnu@public.gpptt.gx.cn*

**20–28** International Congress of Mathematicians (Beijing, China) *http://icm2002.org.cn/*

**25–Sept 1** 40th International Symposium on Functional Equations (Gronow, Poland)  
*isfe40@uz.zgora.pl http://www.isfe40.uz.zgora.pl*

**SEPTEMBER 2002****SEPTEMBRE 2002**

**23–28** Workshop on Categorical Structures for Descent and Galois Theory, Hopf Algebras and Semiabelian Categories,

(The Fields Institute for Research in Mathematical Sciences, Toronto)  
*tholen@mathstat.yorku.ca*

**29 – Oct. 3** 18th International CODATA Conference (Hotel Delta Centreville, Montreal, Que)  
*codata@dial.oleane.com, http://www.codata.org*

**OCTOBER 2002****OCTOBRE 2002**

**17 – 19** NCTM Canadian Regional Conference (Regina, Saskatchewan) Hosted by the Saskatchewan Mathematics Teachers' Society.  
*http://www.nctm.org/, http://mathcentral.uregina.ca/SMTS/*

**DECEMBER 2002****DÉCEMBRE 2002**

**8–10** CMS Winter Meeting / Réunion d'hiver de la SMC (Marriott Hotel, Ottawa, Ontario)  
*http://www.cms.math.ca/Events/winter02/index.html*

**JANUARY 2003****JANVIER 2003**

**Jan – Aug** Thematic Program on Automorphic Forms, (The Fields Institute for Research in Mathematical Sciences, Toronto)  
*Automorphic@fields.utoronto.ca*

**FEBRUARY 2003****FÉVRIER 2003**

**10–15** Mathématiques Appliquées et Applications des Mathématiques (Nice, France)  
*http://www.acm.emath.fr/amam/*

**JUNE 2003****JUIN 2003**

**CMS Summer Meeting / Réunion d'été de la SMC (University of Alberta, Edmonton, Alberta)**  
*Monique Bouchard: meetings@cms.math.ca*

**17–21** Fourth Geoffrey J. Butler Memorial Conference (University of Alberta, Edmonton, Alberta, Canada)  
*http://conley.math.ualberta.ca/butler.html*

**JULY 2003****JUILLET 2003**

**27 - Aug. 9** Banach algebras and their applications (University of Alberta, Edmonton, AB)  
*http://www.math.ualberta.ca/ba03/*

**DECEMBER 2003****DÉCEMBRE 2003**

**CMS Winter Meeting / Réunion d'hiver de la SMC (Simon Fraser University, Burnaby, British Columbia)**  
*Monique Bouchard: meetings@cms.math.ca*

**SUMMER 2004****ÉTÉ 2004**

**CMS Summer Meeting / Réunion d'été de la SMC**  
**(Dalhousie University, Halifax, Nova Scotia)**  
*Monique Bouchard: meetings@cms.math.ca*

**CMS Winter Meeting / Réunion d'hiver de la SMC**  
**(McGill University, Montréal, Québec)**  
*Monique Bouchard: meetings@cms.math.ca*

DECEMBER 2004

DÉCEMBRE 2004

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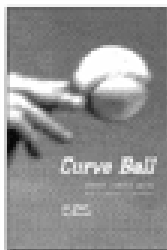
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